1972-73

HARVARD SCHOOL OF PUBLIC HEALTH

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HARVARD SCHOOL
OF
PUBLIC HEALTH

Announcement of Courses and General Information

1972-73

55 Shattuck Street, Boston, Massachusetts 02115

PUBLISHED BY THE UNIVERSITY

Graduate students from many parts of the world come to study in Harvard's School of Public Health. Physicians, engineers, physical scientists, social scientists, and other health specialists prepare here for careers of leadership in teaching, research and the administration of health services, both nationally and internationally.

The Harvard School of Public Health operates as an autonomous unit of Harvard University in close association with the Faculties of Arts and Sciences, Divinity, Government, Business Administration, Education, Law, Medicine and Dental Medicine.

CONTENTS

ONE INTRODUCTORY INFORMATION

TWO ADMISSION AND DEGREES

THREE CENTERS

FOUR DEPARTMENTS AND CONTENT OF COURSES

FIVE SPECIAL PROGRAMS

SIX GENERAL INFORMATION

EDUCATIONAL FACILITIES BUILDING
677 Huntington Avenue, Boston

ONE

INTRODUCTORY INFORMATION

ACADEMIC CALENDAR–1972-1973

***SEPTEMBER 11, MONDAY, 10 A.M.**	Opening session and registration for new International Students
***SEPTEMBER 13, WEDNESDAY, 2 P.M.**	Opening session and registration for new U.S. Students

The period between the opening sessions and September 20 will be devoted to orientation lectures, individual conferences with faculty members, and selection of courses of study.

***SEPTEMBER 18, MONDAY, 10 A.M.**	Opening session and registration for students enrolled in 1971–72.

FALL TERM, SEPTEMBER 20, 1972 THROUGH JANUARY 28, 1973

SEPTEMBER 20, WEDNESDAY	First Period Courses begin
OCTOBER 9, MONDAY	Columbus Day: a holiday
OCTOBER 23, MONDAY	Veterans' Day: a holiday
NOVEMBER 18, SATURDAY	First Period ends
NOVEMBER 20, MONDAY	Second Period Courses begin
NOVEMBER 23 and 24, THURSDAY and FRIDAY	Thanksgiving Recess

Recess from Thursday, December 21, 1972 through Wednesday, January 3, 1973

JANUARY 10, WEDNESDAY	Spring Term Orientation Day
JANUARY 27, SATURDAY	Second Period Courses end
JANUARY 29, MONDAY through FEBRUARY 3, SATURDAY	Directed reading period, supervised special studies or field observations

* All students are required to attend the opening session and to be present for the registration period.

SPRING TERM, FEBRUARY 5, 1973 THROUGH JUNE 14, 1973

FEBRUARY 5, MONDAY	Third Period Courses begin
FEBRUARY 19, MONDAY	Washington's Birthday: a holiday
MARCH 31, SATURDAY	Third Period ends

Recess from Sunday, April 1, 1973 through Sunday, April 8, 1973

APRIL 9, MONDAY	Fourth Period Courses begin
MAY 28, MONDAY	Memorial Day: a holiday
JUNE 2, SATURDAY	Fourth Period ends
JUNE 4, MONDAY through JUNE 13, WEDNESDAY	Post-class Period
JUNE 14, THURSDAY	Commencement

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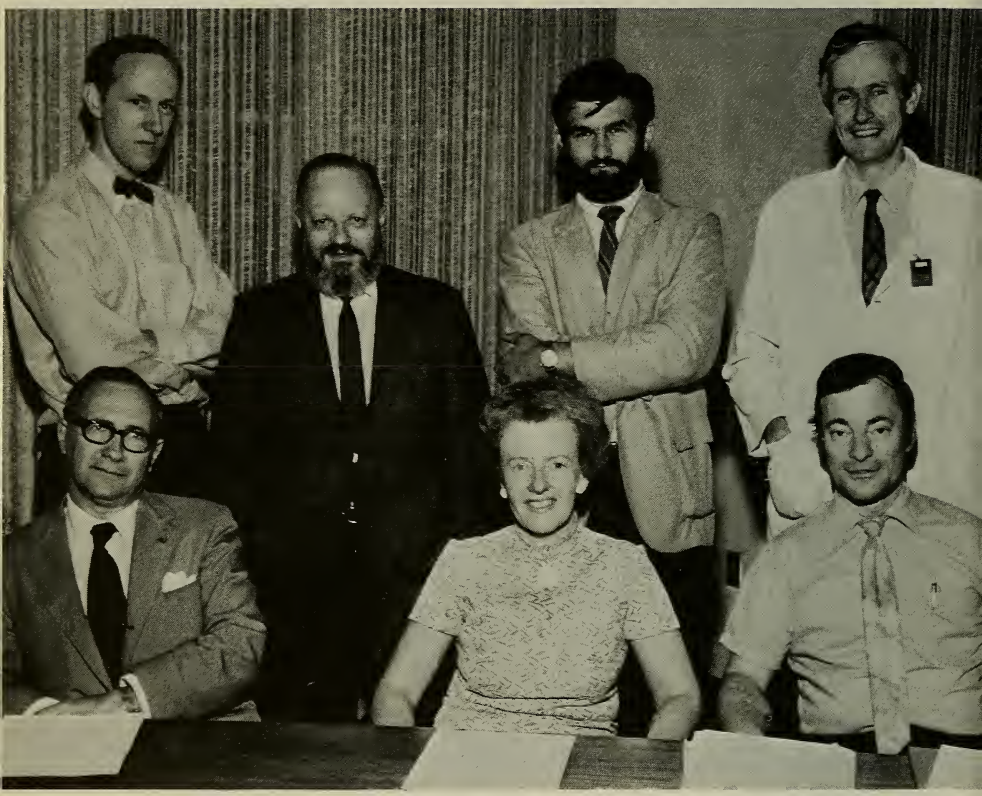

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The School and Its Facilities

The Harvard School of Public Health is primarily devoted to graduate education in public health and its aim is to provide opportunities for those who seek careers in one or more of the principal areas of public health activities — teaching, research, and the administration of health services, both nationally and internationally.

Public health evolved from the early combination of medical science and engineering for the control of environmental hazards. It has grown to embrace various facets of the biological, physical and social sciences as community aspects of health problems have become more complex and demanding. Public health now depends upon the skills and knowledge of members of several professions. The role of a graduate school of public health today is to prepare those who will be concerned with health problems which lie outside the scope of any single discipline, problems which can be solved best by the skillful cooperation of physicians, nurses, engineers, physical scientists, social scientists and other health specialists.

HISTORY OF THE SCHOOL

Activity in professional education in the field of public health had been steadily increasing in Harvard University over a period of more than two decades before the actual founding of the School, in 1922. The development was a gradual one, characterized by certain important steps, the first of which was the establishment in 1909 of the Department of Preventive Medicine and Hygiene in the Medical School — the first such department in the United States. The degree of Doctor of Public Health was first conferred in 1911. In this same year a Department of Sanitary Engineering was inaugurated in the Graduate School of Engineering. In 1913 the Department of Tropical Medicine, and in 1918 the Division of Industrial Hygiene, with clinical and laboratory facilities, were organized in the Harvard Medical School.

In 1913 the Harvard-Massachusetts Institute of Technology School for Health Officers was formed under the joint management of Harvard University and the Massachusetts Institute of Technology. This School operated until the fall of 1922, when it was superseded by the Harvard School of Public Health which was made possible by a generous endowment for this purpose from The Rockefeller Foundation.

When the School first opened, several departments were set up as joint departments with the Medical School, with shared facilities, faculty and budgets. This arrangement continued until 1946 when another grant from The Rockefeller Foundation provided additional space and facilities for the School of Public Health. At this time the School was separated administratively and financially from the Medical School and became an autonomous unit of Harvard University. It continues to cooperate with the Medical School in teaching and research, and has also developed close association with

other schools of the University, particularly the Graduate Schools of Arts and Sciences, Government and Business Administration.

OBJECTIVES OF THE SCHOOL

The objectives of the School of Public Health are the advancement and dissemination of knowledge relating to human health and well-being. To fulfill these objectives the School provides instruction to graduate students and research fellows, conducts research, and participates in national and international health activities.

In its efforts to advance knowledge, the School is concerned with health problems of major importance to society, not only in the highly urbanized and technologically advanced regions, but also in the predominantly rural or economically disadvantaged areas of the world.

The educational program of the School provides advanced instruction in the community-oriented health sciences and in the techniques of administration for highly qualified young men and women who have potential for imaginative leadership.

In its involvement in the contemporary health problems of society, the School collaborates with community leaders in seeking ways in which knowledge can be effectively used for the advancement of human health. The School is particularly concerned with the development of realistic social policies in relation to health problems and population growth. New developments in these fields may be reflected in elective courses designed to meet the special needs and interests of students at their request. Such courses are usually offered in the individual departments under the tutorial program.

DUAL ROLE OF THE SCHOOL

The School has the dual role of (1) a professional school that provides for the generalist a comprehensive broad program of basic knowledge in relevant health sciences and (2) a graduate school that provides advanced instruction and opportunities for independent study in depth for those students who seek to become specialists in one of the public health disciplines. To ful-

fill these roles, two different degree programs are offered. One involves the professional degrees of Master and Doctor of Public Health with a wide range of required subjects. Candidates for these degrees must be graduates of approved schools of medicine, dentistry or veterinary medicine; in some cases, qualified individuals who hold doctoral degrees in the biological sciences may be admitted to the program.

The other program leads to the degrees of Master and Doctor of Science in a public health discipline, and provides the opportunity to concentrate intensively in an area of special interest. The backgrounds of the candidates for these degrees range across the physical, biological and social sciences — engineers, health educators, nurses, nutritionists, social workers and statisticians. Individuals with a doctoral degree in the medical or biological sciences may elect these programs if they prefer a specialized area of study.

THE LOCATION AND BUILDINGS

The twelve departments of the School of Public Health are housed in the Rotch Building at 55 Shattuck Street, the Health Sciences Laboratories at 665 Huntington Avenue, and the Educational Facilities Building, 677 Huntington Avenue, Boston. The administrative offices are located on the top floor of the Educational Facilities Building. The School's buildings are adjacent to the Harvard Medical and Dental Schools, the Countway Library of Medicine, the Children's Medical Center, and the Peter Bent Brigham Hospital.

OTHER FACILITIES

The facilities of the hospitals and the adjacent institutions are available to qualified students of this School, and are used in connection with the teaching of various subjects. In addition, students enrolled at the School may take courses in other departments of Harvard University, such as in the social sciences, public administration, economics, statistics and medical sciences. Certain graduate courses at the Massachusetts Institute of Technology are also open to students of this School.

The Department of Sanitary Engineering of the School is also part of the Division of Engineering and Applied Physics of the Harvard Graduate School of Arts and Sciences in Cambridge. Qualified students may register for courses given by the Division of Engineering and Applied Physics.

The School maintains a close association with a wide variety of health, medical care, and welfare organizations in Massachusetts and elsewhere. These include health departments, hospital and other medical facilities, private health and welfare agencies, and community planning groups. These organizations provide opportunities for observation and special studies, and members of their staffs are available to assist in the School's educational program. Administrative methods at local levels may be studied at first hand in some of these agencies in the Greater Boston Area.

The State Laboratory Institute of the Massachusetts Department of Public Health is engaged in a program of general interest, attracting visitors and students from various parts of the United States and from foreign countries. It performs a wide variety of bacteriological, immunological and chemical procedures, and is engaged in several research programs. This close contact with one of the country's outstanding laboratories provides excellent opportunities for qualified students who wish to obtain intensive experience in many types of laboratory methods of particular pertinence to public health.

The clinical and laboratory facilities of the Lemuel Shattuck Hospital are available to students of the School. This hospital was built by the Department of Public Health of the Commonwealth of Massachusetts for the treatment and rehabilitation of patients with chronic diseases. Since the average duration of hospitalization is usually longer than that in general hospitals, an opportunity is afforded to study chronic disease problems not encountered in general hospitals. The training program, consultant rounds and professional staff appointments are under the aegis of the Deans of Boston University, Harvard and Tufts University Medical Schools, as well as the Harvard School of Public Health. Research laboratories at the Shattuck Hospital are engaged in studies of arthritis, hematology,

pulmonary function, radioisotopes, cancer therapy and chronic renal and hepatic diseases.

HEALTH SCIENCES COMPUTING FACILITY

Computing and data processing services are available to students through the Health Sciences Computing Facility, which is operated by the School of Public Health. A staff of systems analysts and computer programmers assists researchers and students from all the Harvard Medical Area institutions in using the computer as a tool for analyzing data, for doing extensive numerical calculations and for acquiring, maintaining, and processing large data bases.

HSCF is equipped with unit record machines, including a counting card sorter and a variety of card punching machines. Remote batch processing computing is accomplished by a high-speed telephone link to the IBM 370/165 computer at the Massachusetts Institute of Technology. Interactive computing (time sharing) capability is provided by low-speed terminals which are connected to several large computers in the New England area, notably the Honeywell 635 at Dartmouth College. Many projects use the optical scanning machine at HSCF to convert data into machine-readable form.

HSCF staff members give a short course in computing (Biostatistics 213e) at the end of each Term. There are also special tutorials for interested students who have had prior computing experience. The Director of the HSCF is Mr. Raymond Neff.

LIBRARIES

The library needs of the School of Public Health are served principally by the Francis A. Countway Library of Medicine, which opened its doors to readers in June 1965. The Countway Library, located at 10 Shattuck Street, combines the resources and services of the Harvard Medical Library and the Boston Medical Library. Among libraries serving medical and health-related schools, it is the largest in the country. Its recorded holdings number 435,000 volumes, and it receives 5,300 periodicals annually. The Countway Library is open:

The Countway Library of Medicine Periodical Room

8:00 A.M. to 11:30 P.M. weekdays
9:00 A.M. to 5:00 P.M. Saturdays
2:00 P.M. to 11:30 P.M. Sundays

In addition to its holdings of current books and periodicals, the Countway Library has extensive collections of historical materials, dating from the 15th Century. Its History of Medicine Department provides modern facilities for the use of these books and other rarities.

For the convenience of the several departments of the School, collections of books and journals are maintained within those departments.

All members of the University may borrow from the College Library at Cambridge. Messenger service is provided daily between the College Library, various other Harvard University Libraries, and the Countway Library.

The Boston Public Library issues cards to permanent and to temporary residents of Massachusetts. Other libraries of the Boston

area, notably those of the Massachusetts Institute of Technology, add to the total book and periodical resources available to students.

Through the generosity of the Harvard School of Public Health, Class of 1966, a typewriter is available in the Countway Library for the use of students.

The librarian of the Countway Library is Harold J. Bloomquist, and Dr. Jean Mayer represents the School of Public Health on the Library Committee.

HENRY LEE SHATTUCK INTERNATIONAL HOUSE

The Henry Lee Shattuck International House is maintained by the Harvard School of Public Health on a nonprofit basis as a residence for its students and their families from the United States and abroad. Located within walking distance of the School at 199, 203 and 207 Park Drive, the House comprises sixty-one individual apartments of one to four rooms, each with its own kitchenette, bath and foyer. The nine two-bedroom and two three-bedroom apartments are reserved for families with two or more children. The apartments are furnished with basic items except for linens, blankets, and kitchen utensils and are leased for the ten-month period September 1 through June 30. Included in the monthly rent are hot water, heat, janitor service and all utilities except telephone.

In addition, the Shattuck International House provides a playroom and an outdoor playground suitable for small children, a laundry room, and a study room. There is also a modern Recreation Area for adults consisting of a library, music rooms, a large meeting room, and fully equipped kitchen. These facilities are available to all students enrolled at the School of Public Health. Here under the sponsorship of faculty and students are held informal gatherings and scheduled events, offering many opportunities for exchange of ideas and information about the culture, geography and social structure of the many countries represented in the House and the School.

The Shattuck International House was established in 1960 by the Faculty, alumni and friends of the School for students and their families, with the hope that it would serve as a dignified residence and a congenial center for recreational and cultural activities.

TWO

ADMISSION AND DEGREES

Application for Admission

Applicants must submit the following for consideration by the Committee on Admissions and Degrees: (1) completed application form; (2) transcripts of academic record at college, graduate school and/or professional school; (3) names of at least three people, well acquainted with the applicant's previous work, from whom the School may request letters of reference.

An application fee of $15, which is not refundable, is required for each formal application. A check drawn on a bank in the United States, a postal money order, or an international money order, payable to the Harvard School of Public Health, must accompany the application.

Applicants from countries in which the language of instruction is not English must satisfy the Committee as to their ability to speak, read, write and understand the English language competently. The applicant ought to have sufficient knowledge of English to enable him to understand lectures in English, to participate in seminar discussions and to write examinations. In the absence of sufficient evidence from the sponsoring agency and other sources, the School may request that the applicant take and pass satisfactorily the Test of English as a Foreign Language, Box 899, Princeton, New Jersey, 08540, U.S.A. If, upon arrival at the School, a student's command of English is not found to be adequate, he may be required to take further instruction in English.

In addition to fulfilling the specific requirements for admission to a degree program, applicants must satisfy the Committee as to their ability to undertake advanced study at a graduate level. The final decision as to the admissibility of an applicant rests with the Committee on Admissions and Degrees.

The School is unable to accept all who are eligible for admission. Therefore, persons who wish to be considered for admission are urged to submit their applications by April 1st prior to the academic year in which they wish to enroll. However, applications which are

completed by *April 30th*, will be considered, subject to availability of space.

Admission of a candidate for one academic year does not automatically admit him in a subsequent year; re-application is considered on the same basis as a new application.

All inquiries and communications regarding admission should be addressed to the Director of Admissions, Harvard School of Public Health, 55 Shattuck Street, Boston, Massachusetts, 02115.

Living Expenses

Living costs in the Boston area are higher than in most areas from which students come. Therefore, the school has adopted the policy stated below in regard to applicants for admission from outside the United States.

An applicant whose financial support is not guaranteed by an official U. S. agency or foundation must submit evidence satisfactory to the School that he will have sufficient funds available in U. S. currency to enable him to pay his expenses during the academic year. The minimum amount needed by a single person, in addition to travel, is $6,150, to cover cost of tuition ($3,000) and living expenses of at least $350 a month for approximately nine months. If an applicant plans to bring his family, he must have at least $1,800 more for his wife and $900 for each dependent child, in addition to travel expense. Certification of adequate financial resources must be received by the School before the immigration form needed to obtain a visa to enter the U.S. can be issued to the student.

Courses of Study and Degrees

MASTER OF PUBLIC HEALTH DEGREE

Programs leading to this degree provide a broad background in one of several combinations of the disciplines basic to public health, and are designed primarily for students intending to enter the practice of public health.

Requirements for Admission

1. Applicants may be considered for admission as candidates for the Master of Public Health degree if they satisfy one of the following minimum requirements:

a) Graduation from an approved school with a doctoral degree in a field considered by the Faculty to provide a sufficient basis for a career in the practice of public health. At present, acceptable qualifications in this category include doctoral degrees in medicine, dentistry, veterinary medicine, administration, behavioral

science, biology, economics, engineering, law or government.

b) Enrollment in a course of study leading to one of the above degrees when joint programs for the degree and the Master of Public Health have been specifically approved. At present, such joint programs have been approved only in connection with M.D. and D.M.D. programs.

c) In exceptional instances, the Committee on Admissions and Degrees may consider a period of public health experience, in conjunction with an appropriate bachelor's or master's degree with honor grades, as providing an acceptable basis for consideration for admission to a Master of Public Health program.

2. Persons with these qualifications must satisfy the Committee on Admissions and Degrees as to their scholastic ability to study at a graduate level.

Requirements for the Degree

1. A program leading to the Master of Public Health degree usually has both depth and breadth components. The depth component will vary according to the individual interest, prior preparation, and goals of the student. However, it should be recognized that study in great depth of a specific field of public health is not feasible during a Master of Public Health year. Such concentration may be more appropriately pursued by a Master of Science program in a designated field.

The fundamental characteristic of a Master of Public Health curriculum is the provision of a broad preparation for careers in public health. This essential breadth of the Master of Public Health program may be thought of as including the following three areas:

a) fundamental knowledge and concepts about man with particular attention to his interaction with the physical, biological and social environment, and the effects of that interaction on his health;

b) basic techniques of investigation, measurement and evaluation with emphasis on their use in understanding health in human communities; and

c) basic approaches to policy planning and program management and their application to the promotion of community health

within the social, economic and political setting relevant to health services.

As public health problems have increased in variety and complexity, it has become apparent that few professionals will ever achieve complete mastery of all of the three areas listed above. No one can be expected to acquire such mastery within a single year of study. Students who come to the School for a Master of Public Health degree have varying amounts and kinds of prior education and experience. Furthermore, students have different career objectives within the profession and consequently may appropriately wish to emphasize different parts of the three basic areas. Thus, to achieve maximum benefit from the Master of Public Health year, each individual's curriculum should be designed to strengthen his broad preparation for the profession while keeping in mind his background and career objectives.

Planning this type of individualized Master of Public Health program is the joint responsibility of the student and his Faculty advisor. When the student arrives at the School, he should already have evaluated his own experience and objectives in terms of the general breadth requirement of the Master of Public Health degree and should have begun to identify the principal ways in which he would like to strengthen his basic preparation for public health. The Faculty advisor should review this assessment and then offer specific guidance on the manner in which the student's needs can best be served within the School and the University.

The School's Master of Public Health Review Committee will examine the proposed program to determine whether it meets the goals for the Master of Public Health. In general, each program should show reasonable coverage of all three basic areas either through previous work or through the Master of Public Health courses. It is anticipated that for many students this will result in programs that would meet traditional Master of Public Health "course requirements." Other proposed programs may well achieve the intent of the Master of Public Health by using few, if any, of the specific courses which have previously been required. If the Review Committee finds that a proposed Master of Public Health

program does not demonstrate appropriate breadth, the student will be advised to broaden his curriculum in specific ways or he may decide that he is primarily interested in a more specialized Master of Science program.

2. One academic year must be spent in residency at the University. The student must complete successfully the individualized program arranged for him which should consist of basic and specialized courses in his specific field of interest to a minimum total of 40 credit units. The following courses are recommended as basic courses which satisfy in part the fundamental characteristic of a Master of Public Health curriculum:

Course	*Credit units*
Principles of Biostatistics (Biostatistics 101a,b)	3.5
Principles of Epidemiology (Epidemiology 201a)	2.5
The Nature and Function of Health Care Delivery Systems (Health Services Administration 201a,b)	4
Administration and Organization of Health Services (Health Services Administration 203a,b)	4
Economic and Administrative Issues in Medical Care (Health Services Administration 295c,d)	4
Principles of Environmental Health (Environmental Health Interdepartmental 201a,201b)	4
Ecology and Epidemiology of Infectious Diseases (Microbiology and Tropical Public Health 201a,b)	4
Fundamentals of Immunology (Microbiology 207a)	2.5
Introduction to Behavioral Sciences (Behavioral Sciences 101b)	2
Public Health Nutrition (Nutrition 201a, 201b)	2
Determinants, Consequences, and Control or Population Growth (Population Sciences 200a,b or 201a,b)	5 or 2.5
History and Philosophy of Public Health (Interdepartmental Course 201c)	1
Economic Analysis for Public Health (Interdepartmental Course 210a,b)	4

3. Specialized courses, seminars and tutorial work, chosen by the

student on the basis of his field of interest are described on pages 81–183. Certain courses in other graduate Schools of Harvard University and the Massachusetts Institute of Technology are open to full-time students in the Harvard School of Public Health.

4. No formal classes are scheduled during the one-week period between the Fall and Spring terms. This time is available to study data processing in the Department of Biostatistics or for supervised special studies or field observations in other Departments. All candidates for the Master of Public Health degree are required to register for work during this week in Biostatistics 213e (Introduction to Computing), or in Course 300e (Tutorial) or Course 330e (Field Study), in other Departments. Opportunities available are listed under the various Departments. One unit of credit will be given for satisfactory completion of the week's assignment.

MASTER OF SCIENCE

(With Designation of a Field of Concentration)

This degree is granted on fulfillment of a program of advanced work in one of the disciplines of public health represented in the School. Generally speaking, programs are designed for students with interests in the scientific basis of public health and preventive medicine.

Requirements for Admission

Applicants may be considered for admission as candidates for the Master of Science degree on the basis of a one-year or a two-year program if they meet the minimum requirements in one of the following categories:

One-year Program:

1. Graduates of approved schools of medicine, dentistry or veterinary medicine.

2. Holders of a doctoral or master's degree from an approved school in fields acceptable to the department of concentration.

3. Applicants in industrial hygiene, air pollution control, radio-

logical health and public health engineering who meet certain requirements with respect to academic background and experience. Normally this includes receipt of a bachelor's degree with honor grades (including adequate undergraduate training in physics, biology, chemistry and mathematics) supplemented by at least two years of relevant professional experience in the chosen field of specialization.

Two-year Program:

Applicants with a bachelor's degree with a distinguished academic record in areas acceptable to the department of concentration. A year of appropriate graduate work in another approved institution may be accepted as the first year of this program.

The academic background of the individual applicant must be appropriate for a program of study offered by one or more departments of the School. Inquiries concerning these programs should be addressed to the intended department of concentration.

Persons with appropriate qualifications must satisfy the Committee on Admissions and Degrees and the department within which they choose to specialize as to their potentiality for successful study at a graduate level within the School.

Requirements for the Degree

1. The student must spend a minimum of one year in residence at the University and must complete successfully a program of at least 40 credit units. Candidates in the two-year program must obtain at least 80 credit units.

2. All candidates for the degree are required to take Biostatistics 101a,b and Epidemiology 201a, unless they can demonstrate equivalent preparation. Candidates who do not have a background in medicine or biology are advised to take Physiology 203a,b, or a course in general biology elsewhere. The remainder of the program is devoted to courses which may be prescribed by the department of concentration and to elective courses in the primary and related fields of interest. These courses are described on pages 81–183. Courses offered by other Faculties of the University are also available.

3. No formal classes are scheduled during the one-week period between the Fall and Spring terms. This time is available to study data processing in the Department of Biostatistics and for supervised special studies or field observations. All candidates for the Master of Science degree are required to register for work during this week, under Biostatistics 213e (Introduction to Computing), or in Course 300e (Tutorial) or Course 330e (Field Study), given by their Department of concentration. Opportunities available are listed under the Departmental course offerings. One unit of credit is given for satisfactory completion of the week's assignment.

MASTER OF INDUSTRIAL HEALTH

A program of courses leading to a Master of Industrial Health degree is designed to meet the needs for postgraduate training in the public health disciplines which are relevant to the development of preventive medical programs in industry. This degree program is usually taken as part of a two-year approved residency in occupational medicine.

Requirements for Admission

Candidates must be graduates of an approved school of medicine and must also satisfy the Committee on Admissions and Degrees as to their scholastic ability to study at a graduate level. Students from the United States must have completed an internship or residency of at least twelve months in a hospital approved by the American Medical Association.

Requirements for the Degree

1. One academic year must be spent in residence at the University.
2. The student must complete successfully the required and elective courses to a minimum total of 40 credit units. All candidates for the degree are expected to take the following courses unless they can demonstrate equivalent preparation:

Course	*Credit units*
Principles of Biostatistics (Biostatistics 101a,b)	3.5
Principles of Epidemiology (Epidemiology 201a)	2.5
Principles of Environmental Health (Environmental Health Interdepartmental 201a,201b)	4
Radiation Protection (Environmental Health Sciences 271a,b)	5
Basic Problems in Occupational Health and Industrial Environments (Environmental Health Sciences 251c,d)	5
Total	20

In addition, the student may select courses from the curriculum approved for residencies in Occupational or Aviation Medicine.

3. No formal classes are scheduled during the one-week period between the Fall and Spring terms. This time is available to study data processing in the Department of Biostatistics or for supervised special studies or field observations. All candidates for the Master of Industrial Health degree are required to register for work during this week, under Biostatisitcs 213e (Introduction to Computing), or in Course 300e (Tutorial) or Course 330e (Field Study), given by their Department of concentration. Opportunities available are listed under the Departmental course offerings. One unit of credit will be given for satisfactory completion of the week's assignment.

DOCTOR OF PUBLIC HEALTH

For the degree of Doctor of Public Health the student must complete an approved program of independent and original investigation in a special field and must present the results of this research in an acceptable thesis.

Requirements for Admission

1. An applicant for admission to candidacy for this degree must be either (a) a graduate of an approved school of medicine, dental medicine or veterinary medicine, or (b) the holder of another doctoral degree in one of the basic sciences related to public health.

2. The applicant must hold the degree of Master of Public Health or its equivalent from an approved institution and must have demonstrated potential ability to undertake original investigation in a special field.

3. Admission to doctoral candidacy is considered provisional until the candidate has passed the oral qualifying examination.

DOCTOR OF SCIENCE

(With Designation of a Field of Concentration)

This degree is granted on successful completion of a program of independent and original research in one of the basic disciplines of public health, and the presentation of this research in an acceptable thesis.

Requirements for Admission

Candidates for the degree of Doctor of Science must hold the degree of Master of Science or its equivalent and must indicate ability to undertake original investigation in a special field.

Admission to doctoral candidacy is considered provisional until the candidate has passed the oral qualifying examination.

REQUIREMENTS FOR DOCTORAL DEGREES

Residence

The student is required to complete a minimum of one academic year in residence. However, the required work and preparation of an acceptable thesis normally require at least two full years and frequently longer.

"Residence" requirements are fulfilled by payment of tuition and pursuit of an approved program. The first year is almost invariably in actual physical residence at the School. Subsequently, the thesis work may be continued at the School, or, in special circumstances, may be done *in absentia*. For thesis work done *in absentia*, the Adviser and the appointed evaluators must meet with the candidate to appraise the thesis plan. Agreement must be reached and the

Committee on Admissions and Degrees must be advised in writing prior to the departure of the student as to:

(a) The acceptability and feasibility of the proposed thesis plan
(b) The timing and scope of periodic written reports which will be required of the student
(c) Arrangements which have been or can be made for direct field supervision of the student
(d) The minimum period of time the student will spend at the School prior to submitting his thesis for appraisal by the Readers; a minimum of four months is recommended.

Doctoral Program Adviser

After the student enrolls in the School as a provisional doctoral candidate, a Doctoral Program Adviser is appointed by the Department of concentration. This Adviser keeps the student informed of all procedures and requirements for the degree, advises him about proper courses to be taken; decides, together with the Department, when the student is prepared to take the qualifying examination, and supervises the thesis work.

Qualifying Examination

The qualifying examination for admission to full doctoral candidacy consists of Part A and Part B.

Part A is administered by the Department of concentration, and consists of a thorough examination in the field of concentration and closely related areas. As many of the Departmental Faculty as possible should be involved in this examination. The examination may be written, oral, or both — at the discretion of the Department. On satisfactory completion of this part of the examination, the candidate is eligible to take Part B.

Management of Part B is the responsibility of the Committee on Admissions and Degrees and the Registrar. It is an oral examination in the field of concentration and at least two other relevant fields. In the field of concentration the examination focuses on the candidate's imaginative use of principles and ability to apply his

knowledge, rather than his basic background of knowledge which has already been tested in Part A. The other fields of examination need not necessarily be related to the student's thesis topic; they are selected by the Department of concentration with approval of the Committee.

Both parts of the qualifying examination should normally be completed within one year of registration as a provisional doctoral candidate. Part A is scheduled by the Department and Part B by the Committee on Admissions and Degrees and the Registrar. Part B of the examination is open to all Faculty members; however, decision as to the outcome of the examination rests solely with the appointed examiners. The decision may be (a) pass, (b) general failure — requiring complete re-examination, or (c) specific failure — requiring re-examination only in the specified subject. Permission for re-examination rests with the Committee on Admissions and Degrees, on the recommendation of the examiners.

Evaluation of Candidate's Progress

After the candidate has passed the qualifying examination, two Faculty members are appointed to aid the Adviser in the periodic evaluation of the student's progress.

Form of Thesis

The thesis should consist of one or more manuscripts suitable for publication in a scientific medium appropriate to the candidate's field. If the work is published prior to submission of the thesis, copies of the publication may be submitted in lieu of manuscript. If not included in these documents, there should be added an introduction describing the historical setting and objectives of the work and a concise discussion that would provide an overall evaluation of its significance. Technical appendices should be added where necessary to demonstrate the full development of the thesis material.

Papers published under joint authorship are acceptable provided that the candidate has contributed a major part to the investigations. He is expected to be senior author on at least one of the papers. In the case of manuscripts published under joint authorship, the co-authors or the Adviser may be consulted by the Readers or the

Committee on Admissions and Degrees to clarify the nature and extent of the candidate's contribution.

In addition to evaluating the quality and significance of the work, those responsible for accepting the thesis (the Department and the Readers) may determine whether the format is suitable for publication in a scientific medium appropriate to the candidate's field.

Evaluation of Thesis

The thesis must first be accepted by the Department of concentration. When it is, three unbound copies should be deposited in the Registrar's Office. On request of the Department, the Committee on Admissions and Degrees will appoint three or more Readers. When the Readers have individually evaluated the thesis, they will meet, together with one or more members of the Committee, and make a joint recommendation regarding acceptance of the thesis. If the thesis is accepted, the Committee on Admissions and Degrees may then recommend the candidate to the Faculty for the degree. The degree is voted by the Faculty at its special midyear or June meeting.

The Readers, as individuals or at their meeting, may call on the student for clarification, augmentation or defense of material presented in the thesis.

The unbound copies of the thesis must be in the Registrar's Office before *January first*, for degrees to be awarded at mid-year, and *before April fifteenth* for degrees to be awarded in June. In order to meet these deadlines, the candidate should submit the completed thesis to his Department at least two weeks in advance of these dates.

An acceptable thesis must be submitted within 5 years of the date of registration as a provisional doctoral candidate.

Final Seminar

There is no formal public thesis defense. However, after acceptance of the thesis by the Committee of Readers, the Department of concentration is responsible for the arrangement of a seminar at which the candidate will present and discuss his thesis work. These seminars are announced throughout the School, and are open to Faculty, research staff and students.

Credit Assignment

Credit units are assigned on the basis of the total amount of time required by a course, both in class and outside of class. Twenty credit units constitute a full program for one term.

Grading System

Many courses are graded on an ordinal five-step system as follows: A — honor grade; B — high pass; C — pass; D — marginal pass; F — no credit. Courses which are not graded on the five-step system are graded as "Satisfactory" or "Unsatisfactory." *Satisfactory* indicates performance of sufficiently high quality for credit to be assigned.

Special Students

Subject to availability of space, the School may accept a few students, on a full-time or a part-time basis, who are not degree candidates, but who are interested in taking one or more courses in a special field. Procedures and requirements for the admission of such students are the same as for degree candidates. Special students who later wish to be admitted to degree candidacy will be considered on the same basis as other applicants for admission. Admission as a special student carries with it no commitment to accept the applicant as a degree candidate.

Degrees in Engineering

Graduates of engineering colleges or scientific schools of recognized standing who are interested in environmental engineering may be admitted to the Division of Engineering and Applied Physics of the Graduate School of Arts and Sciences as candidates for the degree of Master of Science or Doctor of Philosophy. They may elect appropriate courses in the School of Public Health as a part of the program for these degrees.

For further information write to the Committee on Admissions, Graduate School of Arts and Sciences, Holyoke Center, 75 Mt. Auburn Street, Cambridge, Massachusetts, 02138.

THREE

CENTERS

The Kresge Center for Environmental Health

James L. Whittenberger, S.B., M.D., A.M. (hon.), Director
Dade W. Moeller, S.B., S.M., Ph.D., A.M. (hon.), Associate Director

This Center includes the Departments of Physiology, Sanitary Engineering, and Environmental Health Sciences, as well as a subunit specializing in problems of aerospace health and safety. The Center serves as a focus for environmental health activities within the School of Public Health. It also represents Harvard University in the New England Consortium on Environmental Protection and conducts environmental health teaching and research activities with other components within both Harvard University and the Massachusetts Institute of Technology. Such projects include the presentation of undergraduate courses in environmental health to students in Harvard and Radcliffe Colleges, and the presentation of joint courses and seminars with the Division of Engineering and Applied Physics, Faculty of Arts and Sciences.

Full-time Faculty within the Center includes physicians, engineers, physiologists, psychologists, mathematicians, toxicologists, chemists, physicists, meteorologists and other professionals. This diversity enables the staff to deal effectively with environmental problems which require a multidisciplinary approach. The research budget of the Center exceeds one million dollars annually. Further details on the nature of research programs currently underway may be found in the introductory portions of the Departmental writeups found elsewhere in this catalogue.

Specific subject categories in which the Center conducts research and training include:

1. Aerospace Health and Safety
2. Air Pollution Effects and Control
3. Environmental Physiology
4. Environmental Toxicology
5. Human Factors — Accident Prevention

6. Industrial Hygiene
7. Occupational Medicine
8. Radiological Health
9. Respiratory Physiology
10. Sanitary Engineering

Degree programs available within the above areas include the Master of Science, Master of Industrial Health, Doctor of Science and Doctor of Public Health. Formal requirements for each of these degrees are outlined in other sections of the catalogue. Students interested in any of the above areas ordinarily enroll in the School of Public Health. Students whose primary interest is in problems of water quality and water resources generally enroll in the Division of Engineering and Applied Physics of the Graduate School of Arts and Sciences.

Applicants desiring further details on any of these programs are encouraged to write to the Director of Admissions, the Head of the appropriate Department, or to the Director of the Kresge Center.

Center for the Prevention of Infectious Diseases

Thomas H. Weller, A.B., S.M., M.D., LL.D., Director
Roger Loyd Nichols, A.B., M.D., A.M. (hon.) Associate Director

The Center for the Prevention of Infectious Diseases is comprised of the Departments of Microbiology and of Tropical Public Health. Working in close collaboration, the staffs of the two Departments are concerned with the broad spectrum of agents, i.e., viral, rickettsial, bacterial, mycotic, protozoal, and helminthic entities, that parasitize man and with their relevant arthropod and molluscan vectors.

On a global basis the infectious diseases remain a primary cause of mortality. In the developed areas of the world, morbidity attributable to infectious diseases persists as a major impediment to the enjoyment of complete health. An increasing number of chronic degenerative diseases are recognized as stemming from the insults of prior infectious processes. In many societies, acceptance of the concept of population control awaits containment of undue mortality induced by the infectious diseases and the consequent assurance that children who are born will have a reasonable prospect of achieving maturity. Considerations such as the foregoing emphasize the continuing need for the public health expert to possess knowledge of the rapidly changing technology of the control of infectious diseases, as well as a basic knowledge concerning the attributes and epidemiologic characteristics of the responsible agents.

The Faculty of the Center for the Prevention of Infectious Diseases operates in close collaboration to discharge a common responsibility for multidisciplinary instruction in the various facets of diseases of infectious etiology. The formal course offerings of the two Departments are designed and scheduled to permit the acquisition of a broad basic knowledge of infectious diseases as well as an introduction to specialized subject areas. For advanced

qualified students, concentration in specific areas with participation in collaborative or individual research is encouraged both at the pre-doctoral and the post-doctoral levels. The wide variety of current research projects in the Center permits acquisition of experience both at home and abroad, in the laboratory or in the field. Training grant funds are available for the support of qualified individuals specifically interested in public health bacteriology, rickettsiology, virology, mycology, parasitology, and tropical medicine.

Center for Population Studies

Roger Revelle, A.B., Ph.D., S.D. (hon.), A.M. (hon.), L.H.D., LL.D., Richard Saltonstall Professor of Population Policy and Director of the Center
John C. Snyder, A.B., M.D., LL.D., Professor of Population and Public Health and Medical Director of the Center.
Elihu Bergman, A.B., A.M., Ph.D., Assistant Director and Member of the Center.

Members of the Center for Population Studies who are also members of the Department of Population Sciences are listed under the description of the Department on page 164. Other Members of the Center are:

Russell G. Davis, A.B., ED.M., ED.D., Member of the Center for Population Studies; *Professor of Education and Development, Harvard Graduate School of Education*

Robert Dorfman, A.B., A.M., PH.D., A.M. (hon.), Member of the Center for Population Studies; *David A. Wells Professor of Political Economy, Department of Economics, Harvard University, Member of the Faculty of the School of Government*

Gino Germani, LIC-EN-PHIL, Member of the Center for Population Studies; *Monroe Gutman Professor of Latin American Affairs, Department of Sociology, Harvard University*

Roy O. Greep, S.B., S.M., PH.D., A.M. (hon.), S.D. (hon.), *Professor of Anatomy and Director of the Laboratory of Human Reproduction and Reproductive Biology, Harvard Medical School*

Nathan Keyfitz, B.SC., PH.D., Member of the Center for Population Studies; *Andelot Professor of Demography and Sociology, Harvard University*

Alexander D. Langmuir, A.B., M.D., M.P.H., Member of the Center for Population Studies; *Visiting Professor of Epidemiology, Harvard Medical School*

Harvey Leibenstein, S.B., A.M., PH.D., Member of the Center for Population Studies; *Andelot Professor of Economics and Population, Department of Economics, Harvard University*

George Fisk Mair, A.B., A.M., PH.D., Member of the Center for Population Studies; *Visiting Professor of Economics, Department of Economics, Harvard University*

JEAN MAYER, B.A., B.SC., M.SC., PH.D., D.SC., A.M. (hon.), M.D. (hon.), Member of the Center for Population Studies; Professor of Nutrition and Lecturer on the History of Public Health

RALPH B. POTTER, JR., A.B., B.D., TH.D., Member of the Center for Population Studies; *Professor of Social Ethics, Harvard Divinity School*

JANET W. MCARTHUR, A.B., M.D., Member of the Center for Population Studies; *Associate Professor of Obstetrics and Gynecology, Harvard Medical School*

PETER P. ROGERS, B.ENG., S.M., PH.D., Research Associate in Population Studies; *Associate Professor of Environmental Engineering, Division of Engineering and Applied Physics, Harvard University, Associate Professor of City Planning, Graduate School of Design*

*CARL J. BAJEMA, S.B., A.M., PH.D., Research Associate in Population Studies; *Associate Professor of Sociology, Grand Valley State College, Michigan*

*KATHERINE A. FINSETH, A.B., M.D., M.P.H., Research Associate in Population Studies

*ROSE E. FRISCH, A.B., A.M., PH.D., Research Associate in Population Studies

JAMES D. GAVAN, B.SC., S.M., PH.D., Research Associate in Population Studies and Lecturer on Population Sciences; *Lecturer on Economics, Department of Economics, Harvard University*

RICHARD D. TABORS, A.B., M.S.S., PH.D., Research Associate in Population Studies

PAULINE S. WYCKOFF, A.B., Executive Secretary of the Center for Population Studies and Administrative Assistant to the Dean

WILMA E. WINTERS, S.B. IN ED., A.M., S.M., Librarian of the Center for Population Studies

The Center for Population Studies was established in 1964 under the leadership of the School of Public Health as a University-wide Center to help scholars and scientists in different fields join in a common attack on human population problems. The Members of the Center are concerned with teaching and research on the history, dynamics, and means of control of human population changes; the physiology of reproduction; the psychology and sociology of human fertility; interactions between resource development and population growth; questions of economics, health, nutrition, education, and moral values related to population problems; and the physical and social environments of human populations.

A Faculty Advisory Committee guides the operation and development of the Center. All of the Faculties of Harvard University are represented on this Committee. The Faculty of the Center includes members of the Departments of Biology, Economics, Government, and Sociology, the Division of Engineering and Applied Physics, and the Schools of Public Health, Design, Education, Medicine, and Divinity. Two headquarters are maintained, one in Boston in the School of Public Health, and one in Cambridge.

In the School of Public Health, the Department of Population Sciences, as an integral part of the Center for Population Studies, conducts a program of research and teaching on public health aspects of population problems. The Department welcomes qualified candidates for the various degrees offered by the School of Public Health who wish to concentrate on these problems. Elsewhere in the University, courses and seminars open to all qualified students are given by Members of the Center in the Departments of Economics, Sociology, and General Education, in the Medical School, and the Divinity School.

At present, the Center is supporting pre- and post-doctoral research in demography, public health and fertility control, human reproductive physiology, religious attitudes toward fertility control, relations between population growth and economic and social development, and the sociological problems related to changes in human fertility patterns. Several broad research projects are in progress, both in the United States and overseas, and these provide further opportunities for graduate, post-doctoral, and faculty research.

Center for Community Health and Medical Care

Paul M. Densen, S.D., Director

The Harvard Medical School and School of Public Health established the Center for Community Health and Medical Care to serve as a University-wide focus of research and development of new approaches to the organization and delivery of health services. The widening gap between growth of knowledge in the health sciences and capabilities of the system for delivering health services to the American people has become a matter of national concern. The Center is an expression of Harvard's determination to contribute to the nation's effort to facilitate and improve the application of the biomedical sciences toward the improvement of health of the peoples of this country and other countries of the world.

The Director, together with the Dean and the Associate Dean for Hospital Programs of the Medical School, and the Dean and Associate Dean for Community Affairs of the School of Public Health and two members of the Center staff constitute the executive committee of the Center. Members of the Center are drawn from all Faculties of the University in which there is an active interest in health and health care services.

The interdisciplinary staff and faculty members of the Center are concerned with the design of experimental programs as well as the study of existing arrangements, mechanisms, organizations, institutions and related personnel involved in health care.

The Program of the Center includes:

1. Research in the organization and delivery of health services; and
2. Fellowship programs in medicine and public health designed to prepare professionals with the capabilities to design, plan,

manage and evaluate the instrumentalities and the systems for the delivery of health services.

By its involvement of several Faculties of the University and by its programs for young physicians and other professionals, the Center provides a focus for the health activities of Harvard which are broadly directed toward the improvement of health services and medical care.

<< *School of Public Health Commencement Day 1972*

FOUR

DEPARTMENTS AND CONTENT OF COURSES

Course Numbering

100–199	Undergraduate and Graduate Courses
200–299	Primarily Graduate Courses
300–399	Graduate Courses of Reading and Research

Interdepartmental Courses

Interdepartmental Course 201c. History and Philosophy of Public Health

Lectures. *One two-hour session each week, third period. Additional time and credit may be arranged.* Dr. Mayer.

Credit 1 unit.

Recommended as part of basic core curriculum for Master of Public Health candidates.

The course has two major purposes: to help the student of public health gain a picture of the development of his profession, and to use selected historical situations to illustrate how scientific knowledge has interacted in the past with political structure, economic status and cultural attitudes in the determination of the health goals of various societies and the execution of programs. In this light, the development of the science and practice of medicine, sanitary engineering and demography in Ancient Egypt, Greece and Alexandria, Rome, the Arab and European Middle Ages and the Renaissance is broadly sketched. The birth of the concept of a National Health Policy is traced to the Ages of Mercantilism and Enlightenment. The Sanitary Movement and its relation to the Industrial Revolution is examined with particular reference to Britain, France and the United States. The growth of modern concerns with pollution, food contaminants, medical insurance and medical outreach is traced back to specific historical movements. The extent to which present trends in health in developing countries differ from or resemble past developments in industrial countries will be discussed.

Interdepartmental Course 202c,d. Teaching of Community Medicine and Public Health

Seminars. *Two two-hour sessions each week, third and fourth periods.* Dr. Segall and Mrs. Vanderschmidt.

Credit 4 units.

This course is designed for students who are preparing for careers as teachers of community medicine and public health or as administrators of teaching programs. Educational objectives as well as methods for designing and evaluating instructional programs are stressed. Students have an opportunity to study selected educational methods in depth, including: simulations, self-instruction, the lecture, and small group teaching. Each student designs curriculum in an area of interest.

Enrollment is subject to the approval of the Instructor.

Interdepartmental Courses 203–207c,d. Seminars on Educational Policy

Seminars. *One two-hour session each week, third and fourth periods; time to be arranged.* Dr. Segall.

Credit 2 units. Additional credits can be arranged for those desiring extra instruction.

These seminars are designed for students who plan to teach in a variety of educational settings. Each of the five seminars offered is concerned with policy issues which arise in the development of training programs in community medicine and public health for a specific category of health manpower. Through individual instruction and seminar discussions, students will assess the impact of professional expectations, social needs, and institutional constraints on the selection of educational goals. The process of curriculum development will be examined in the light of overall health priorities, the nature of the health care delivery system, the role of the practitioner in relationship to other categories of health manpower, innovations in instructional technology and historical determinants of current educational practices.

203 *Teaching Community Medicine in the United States*, Dr. Kennedy and Dr. Mack.

This seminar is designed primarily for students who plan to teach in medical schools or in governmental agencies in the United States. It will include an overview of American medical education with particular reference to innovative programs in the teaching of community medicine.

204 *Teaching Preventive and Social Medicine in the Developing Countries*, Dr. Koch-Weser, Dr. Morrow and Dr. Karefa-Smart.

This seminar is intended for those students who plan to teach in schools of medicine in the developing countries or who will work in government-sponsored educational programs. Examples will be drawn from representative curricula in the developing countries.

205 *Teaching Community Dentistry.*

This seminar is offered for students who plan to teach in schools of dentistry. It will focus on those curricular issues particularly relevant to the training of dental students in fields related to public health.

206 *Teaching Allied Health Professionals*, Dr. Wilson and Dr. Yankauer.

This seminar is designed for students who intend to teach or administer programs for allied health professionals. Both traditional and innovative approaches will be discussed, including programs for the new cadres of health professionals. Examples include joint training and 'new careers' programs.

207 *Teaching in Graduate Public Health Programs*, Dr. DWYER.

This seminar is intended for students who are interested in teaching in schools of public health or in graduate level community health programs. Current curricula will be analyzed in terms of their appropriateness for preparing public health professionals for current and future responsibilities.

Interdepartmental Course 208a,b. Human Rights in Health

Lectures. *One two-hour session each week, first and second periods.* Dr. CURRAN.

Credit 3 units.

This course includes a comprehensive examination of basic human, personal rights as they bear upon health programs in the United States, other countries, and on an international basis. The development of rights will be considered from the viewpoint of the legal status of persons through the human life span. Among the values examined will be the right to medical care, the right to a healthy environment, equality among people, the rights of women, the rights of children, consumer's rights, the right to privacy, and the rights of subjects in medical research. Consideration will be given to the problems of balancing personal rights against community benefits and community protection.

Problems of human and community rights will be considered in the context of specific health programs such as population control, narcotic and other dangerous drug controls, immunization and nutrition programs among large populations, compulsory hospitalization, and medical care delivery to minority groups.

National and international laws, documents and charters will be examined such as the United Nations Declaration on Human Rights, Rights of Children, International Sanitary Regulations, U.S. Constitutional Bill of Rights, and decisions on birth control, abortion, quarantine, privacy, drug addiction, etc.

Interdepartmental Course 209c,d. Health Services in the Developing Countries

Seminars. *One two-hour session each week, third and fourth periods.* Dr. KAREFA-SMART, Dr. MORROW and Dr. BERGGREN.

Credit 2 units.

This course is designed for those who will be responsible for medical and health care administration in developing countries. It will be problem oriented and each student will be expected to prepare background material for the presentation of a specific case study illustrating some special health problems in these countries.

The areas of interest for this course will center on the following issues: The position of health in the national planning priorities of specific countries; analysis of the resources, both financial and personnel, available for health; institutions and organizational alternatives for translation of the resources into the health goals; the nature of the health team — composition, recruit-

ing, training, and organization; the special methods needed for population coverage and health service utilization at the local and district levels; the changing role of specific disease control programs; a consideration of international aid, both bilateral and multilateral aid programs.

Enrollment is subject to the approval of the Instructor.

Interdepartmental Course 210a,b. Economic Analysis for Public Health

Lectures and discussions. *Two one and one-half hour sessions each week, first and second periods.* Dr. BERRY and Dr. GAVAN.

Credit 4 units.

This course is designed to provide an introduction to the basic principles of economics and economic analysis particularly as they apply in the public health field. The first half of the course will deal with the determinants of supply and demand, the theory of markets, and the concept of economic efficiency. This part of the course will offer a systematic introduction to micro-economic theory. The second half of the course will offer a systematic introduction to macro-economic theory. This part of the course will include national income determination, economic development, economic growth, and aggregate economic policy. The course is particularly appropriate for students who will be taking advanced courses in health services administration, population economics, and public policy in the health field. It is also appropriate for students who just want a general introduction to the analytical techniques of economics as they may be applied in the public health field. Students who wish to prepare a term paper may enroll in this course for 5 credit units.

Interdepartmental Course 211c,d. Human Factors in Health Care and Technology

Seminars. *One two-hour session per week, third and fourth periods.* Dr. PICKETT.

Credit 2 units.

Human Factors in a discipline which combines principles and methods from applied psychology, applied physiology, and anthropometry. It deals with variables which affect the accuracy, efficiency, and safety of human performance. This course is intended for students who will be responsible for the design of health facilities, or for the organization, administration or supervision of health practitioners. It outlines human limitations and capacities that require consideration in designing tasks and equipment, and in scheduling and organizing work. Principles of systems analysis and the impact of new technologies such as automated data storage and retrieval are included in a variety of case studies from medical settings. Some field experience is provided.

Enrollment is subject to the approval of the Instructor.

Interdepartmental Course 300a,b,c,d. Teaching of Community Medicine and Public Health

Time and credit to be arranged. Dr. SEGALL.

An opportunity for tutorial work in curriculum design, development of methods of instruction and evaluation and other areas related to teaching community medicine and public health will be given interested students.

Department of Behavioral Sciences

Alexander H. Leighton, a.b., a.m., m.d., Professor of Social Psychiatry *and* Head of the Department

Dana L. Farnsworth, a.b., s.b., m.d., s.d. (hon.), l.h.d., ll.d., Henry K. Oliver Professor of Hygiene Emeritus (1971); Consultant on Psychiatry

*Charles M. J. Mertens de Wilmars, m.d., lic. en psych., *Visiting Professor of Psychiatry; Professor of Medical Psychology, Faculty of Medicine, Catholic University of Louvain, Belgium*

Morton Beiser, m.d., Associate Professor of Social Psychiatry

Robert C. Benfari, a.b., a.m., ph.d., s.m. in hyg., Associate Professor of Psychology

Jane M. Murphy, a.b., ph.d., Associate Professor of Anthropology

Douglas Porter, a.b., ed.d., Associate Professor of Psychology; Coordinator of Instructional Design and Evaluation in the Office for Instructional Development

*David S. Shapiro, a.b., ph.d., Lecturer on Social Psychiatry

*James E. Barrett, Jr., a.b., m.d., Lecturer on Social Psychiatry; *Assistant Professor of Psychiatry, Harvard Medical School*

*Henry Wechsler, a.b., a.m., ph.d., Lecturer on Social Psychology; *Research Director, The Medical Foundation, Inc.*

*Alice L. Nangeroni, a.b., a.m., Research Associate in Behavioral Sciences; *Assistant to the Chairman, Department of Sociology, Cornell University*

*Victor G. Cardoza, Field Project Administrator

*Jean-Noel Fortin, b.a., m.a., m.d., Consultant on Psychiatry; *Associate Professor of Psychiatry, University of Montreal*

*John S. Harding, a.b., a.m., ph.d., Research Consultant on Psychology; *Professor, Department of Child Development and Family Relationships, Cornell University*

*Herbert O. LeVine, m.d., Consultant on Psychiatry; *Clinical Instructor in Psychiatry, Harvard Medical School*

Mary C. Adams, s.b., Administrative Assistant in Behavioral Sciences

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Edward J. Rolde, a.b., m.d., s.m. in hyg., *Instructor in Psychiatry, Harvard Medical School*

* Part-time in the School of Public Health.

The Department of Behavioral Sciences has a primary concern with the relationship of social and cultural factors to mental health and mental illness. Allied to this is an interest in the way social, cultural, and psychological factors affect the development and effectiveness of planned changes, particularly those involving public health programs.

Students have the opportunity to study psychiatric epidemiology, cross-cultural psychiatry, the characteristics of community services, medical sociology, and the role of cultural factors in health and disease. Because of its crucial importance to all aspects of public health, special attention is given to studying factors which affect program acceptance — why people accept or reject certain public health programs. Throughout the curriculum considerable emphasis is given to research and research methodology.

The Department's teaching plan is therefore geared both to the student who has a social science background and wishes to know more about mental health and illness, and to the student who has a clinical orientation and wishes to know more about the social, cultural, and psychological influences which shape the human community. To supplement Departmental and School resources to achieve this end, the student may take additional courses in other parts of Harvard University such as the Department of Psychiatry and the Department of Social Relations.

The current research of the Department is focused on longitudinal community studies of mental health and mental illness, comparative psychiatric epidemiology, the effects of social and cultural change, the adjustment and adaptive processes of individuals and families after severe illness, the evaluation of psychiatric preventive measures, and the effects of intervention. In addition to being concerned with causal relationships and the building of significant theory, Departmental members give major weight to the development of methods, the revision of concepts, and the testing of reliability and validity of mental health survey techniques. Doctoral candidates and fellows have the opportunity of sharing in these studies as team members, and also of selecting a segment for independent investigation.

Behavioral Sciences 101b. Introduction to Behavioral Sciences

Lectures. *Two two-hour sessions each week, second period.* Dr. LEIGHTON and Staff of the Department.

Credit 2 units.

The behavioral sciences, encompassing such disciplines as sociology, anthropology, psychology, and psychiatry, are highly relevant to many areas of public health practice, programing, and research. It is obviously impossible to present even a cursory review of all pertinent behavioral science subject matter; therefore, material for this course is selected on the basis of its relevance to public health in general. The course also provides the required background for advanced courses given by the Departments of Be-

havioral Sciences, Health Services Administration, and Maternal and Child Health. The approach is illustrative rather than encyclopedic and covers a range of subjects — from such matters as brain function, learning and perception, to the behavior of human groups.

The first of three aims of this course is to survey the present state of social science concepts, theories and methods of research. The second aim is to highlight information, theories, and methods of practical application of the behavioral sciences that will be of use to the policy-maker, the planner, and the teacher. This means attention to the patterning and functioning of health agencies, the factors that influence the acceptance or rejection of public health programs, and the special issues characteristic of poverty and situations of cultural contrast and change. The third area of emphasis is social psychiatry. This new and expanding public health field is examined with particular reference to the prevalence of psychiatric disorders, their social causes, and preventive measures.

Behavioral Sciences 202a. Advanced Topics in the Behavioral Sciences: Personality

Seminars. *One two-hour session each week, first period.* Dr. Beiser and Dr. Benfari.

Credit 2 units.

This seminar involves comparative analysis of selected theories and concepts of personality. The emphasis is on historical and current issues in the field of personality theory, and models of both normal and abnormal functioning are given attention. The aim of the course is to apply principles of personality to mental health research and public health programs. The course is especially appropriate for students planning a career in social psychiatry.

Enrollment is subject to the approval of the Instructor.

Behavioral Sciences 202b. Advanced Topics in the Behavioral Sciences: The Application of the Scientific Method to the Study of Behavior

Seminars. *One two-hour session each week, second period.* Dr. Benfari.

Credit 2 units.

This seminar covers various issues involved in the empirical study of behavior. Topics considered are: the nature of science, operationalism, models of causation, logical bases of inference, construct validity, clinical versus statistical prediction, and the difference between verification and discovery. The course is designed to prepare students for conducting research and utilizing research results in public health especially in the mental health field.

Enrollment is subject to the approval of the Instructor.

Behavioral Sciences 202c. Advanced Topics in the Behavioral Sciences: Social Processes

Seminars. *One two-hour session each week, third period.* Dr. MURPHY. Credit 2 units.

This seminar deals with various ways of conceptualizing and measuring social processes for relevance to public health with particular reference to mental health and mental illness. This includes studies of community integration, social class, and poverty. In addition, attention is given to the family, anomie, social networks, cultural values, and behavior settings. It is designed especially for students who plan to work in fields such as social psychiatry, medical anthropology, or medical sociology.

Enrollment is subject to the approval of the Instructor.

Behavioral Sciences 202d. Advanced Topics in the Behavioral Sciences: Field Surveys in Psychiatric Epidemiology

Seminars. *One two-hour session each week, fourth period.* Dr. LEIGHTON and Dr. BEISER.

Credit 2 units.

This course is complementary to Behavioral Sciences 204c, and carries further the review of problems, concepts and methods in psychiatric epidemiology. Emphasis is given to the assessment of mental health in total populations, regardless of the utilization of treatment services and institutions. While the full range of psychiatric disorders is considered, particular attention is given to neuroses, psychosomatic disturbances and to personality disorders. Approaches to the study of environmental factors are of major concern. The course is primarily for students interested in social psychiatry.

Prerequisites: Behavioral Sciences 204c, or the permission of the Instructor.

Behavioral Sciences 203a,b. Personality Assessment in Field Surveys

Seminars. *One two-hour session each week, first and second periods.* Dr. BEISER and Staff of the Department.

Credit 5 units.

This course will familiarize the student with various data-gathering techniques such as clinical interviews, structured questionnaires, psychological tests, peer judgments and standardized observations which have been used in studying mental health and illness in populations.

A segment of the course will deal with the conceptualization and measurement of positive adaptation, in addition to the more traditional concerns of assessing psychiatric disorder.

Attention will be given to problems of assessing the mental health of children.

Enrollment is subject to the approval of the Instructor.

Behavioral Sciences 204c. Psychiatric Epidemiology: Problems, Concepts and Methods

Seminars. *One two-hour session each week, third period.* Dr. LEIGHTON and Staff of the Department.

Credit 2 units.

The aim of the course is to introduce students to the field of psychiatric epidemiology. Such major objectives as description, etiological investigation, and the applications of epidemiological methods to service needs are reviewed. Emphasis is on major psychoses such as schizophrenia and on the use of data obtained from psychiatric treatment services and institutions.

Prerequisites: Epidemiology 201a, Biostatistics 101a,b, or permission of the Instructor.

Behavioral Sciences 206b. Cross-Cultural Psychiatry

Lectures and Seminars. *One two-hour session each week, second period.* Dr. MURPHY.

Credit 2 units.

This course is designed for public health workers who desire to increase their knowledge regarding mental health and mental illness in contrasting cultural groups. The ground covered includes cultural relativity, cross-cultural epidemiology of psychiatric disorders, and the effects of rapid cultural change, poverty, and sociocultural disintegration. Indigenous practices for the treatment of the mentally ill in non-Western societies are described and their implications discussed. Various contemporary experiments concerned with meeting the psychiatric needs of developing countries are examined.

Enrollment is subject to the approval of the Instructor.

Behavioral Sciences 207c,d. Critical Issues in Community Psychiatry

Seminars. *One two-hour session and two hours of field work each week, third and fourth periods.* Dr. BEISER and Dr. SHAPIRO.

Credit 3 units.

Will not be given in 1972–73.

This series of sixteen seminars deals with the development of the community mental health movement in its relationship to psychiatry, public health, and social welfare. The prevention of psychiatric disorder is given special attention as representing a crucial social issue of general concern. Preventive programs, both past and present, are critically examined. In addition, students are given individual reading assignments.

Field work entails observing and reporting on ongoing and projected programs for the prevention of mental illness at local and state levels. Planning of research will be encouraged.

Behavioral Sciences 208c,d. Urban Social Problems

Lectures and discussions. *One two-hour session each week, third and fourth periods.* Dr. Benfari and Staff of the Department.

Credit 5 units.

This seminar will focus on current urban problems and their relationships to certain minority groups. The format will be readings, films, case analyses, and discussions to highlight typical problem areas such as welfare, education, employment and health that pertain to the hard core poor. The course will cover the concept of poverty, its operational definitions, the qualitative and quantitative aspects of the low income style of life, concepts of prejudice and discrimination, urban problems, identity problems in minorities as groups and as individuals and the polarization process. This course is designed for the public health and social science student who seeks understanding of these relationships using a functional model. The course hopes to raise issues for discussion and to achieve appreciation for the complexity of the problems rather than to present solutions.

Enrollment is subject to the approval of the Instructor.

Behavioral Sciences 209c. Sociological Functioning of Health Agencies

Seminars. *One two-hour session each week, third period.*

Credit 1 unit.

Will not be given in 1972–73.

This course offers a comparative sociological review of the structure and function of major types of organizations involved in the provision of health services and programs, including the general hospital, mental hospital, local health department, and state and federal health services. It includes the analysis of major ways in which elements of the organization may promote or impede the achievement of goals. Attention is given to varying modes of administrative management, motivations of personnel, systems of control, problems in acquiring resources, and patterns of inter-agency relationships.

Behavioral Sciences 210d. Inducing Social Change

Seminars. *One two-hour session each week, fourth period.* Dr. Mertens and Staff of the Department.

Credit 2 units.

This course is designed for various specialists in public health who are charged with responsibility for introducing changes in organizations and communities. The subject matter includes methods and theories of teaching, principles of individual and group psychotherapy, approaches to sensitivity training and group dynamics, and organizational theory. Techniques

and procedures illustrating these theories are presented. The general aim of familiarizing students with existing theories and techniques of inducing social changes is pursued through readings, discussions, and case illustrations.

Behavioral Sciences 211d. Industrial Psychiatry

Lectures, readings, and case illustrations. *One two-hour session each week, fourth period.* Dr. MERTENS.

Credit 2 units.

The course is designed to provide basic information relevant to clinical and case management in industrial and other organizational settings. It analyzes research and clinical findings in such a way as to prepare students to handle not only individual maladaptation, but also disintegration at the organizational level.

The course has a fourfold frame of reference, handling successively etiology and symptomatology of individual and group dysfunction. It is available to students who already have a basic knowledge of psychopathology.

Enrollment is subject to the approval of the Instructor.

Behavioral Sciences 212c. Antisocial Behavior

Seminars. *One two-hour session each week, third period.* Dr. LEIGHTON and Dr. ROLDE.

Credit 1 unit.

This seminar will serve as an introduction to a set of issues which are central to the times and are of increasing importance and relevance to those working in Public Health. The focus will be on types of behavior of individuals who are considered sick or immoral by the majority or the controlling elements of society: e.g. juvenile delinquency, drug addiction, alcoholism, the psychopath, etc. Current views on causation, treatment and prevention will be examined.

Topics will include the life experience of those regarded as outcasts by society, the usefulness of the framework of deviance and control as an alternative to a health-illness perspective, and the necessity and difficulty of an integrated social and psychological approach. The readings will include classics on the topic, many of which are traditionally not part of the education of those in the health field. Throughout the course emphasis will be placed on the avoidance of stereotypic approaches, and the readings and discussion will be interdisciplinary.

Enrollment is subject to the approval of the Instructors.

Behavioral Sciences 300a,b,c,d,e. Tutorial Programs

Time and credit to be arranged. Staff of the Department.

Arrangements can be made for a reading course in selected topics or practical experience in research.

Behavioral Sciences 330e. Field Study

A limited number of openings exist for research experience in the Department's field stations. These opportunities vary in nature from time to time according to the stages of various research projects. Individual arrangements can be made through the Head of the Department.

Behavioral Sciences 350. Research Training

Training in research is available to doctoral candidates through individual arrangements with the Staff of the Department.

Department of Biostatistics

Robert B. Reed, A.B., A.M., PH.D., A.M. (hon.), Professor of Biostatistics *and* Head of the Department

Jane Worcester, A.B., DR.P.H., S.D. (hon.), Professor of Biostatistics and Epidemiology

Jacob J. Feldman, PH.D., Professor of Biostatistics

*Yvonne M. M. Bishop, B.A., S.M. IN HYG., PH.D., Associate Professor of Biostatistics; *Statistician to the Children's Cancer Research Foundation*

Margaret E. Drolette, A.B., M.P.H., PH.D., Associate Professor of Biostatistics

*Todd M. Frazier, A.B., S.M., Associate Professor of Biostatistics; *Assistant Director, Center for Community Health and Medical Care.*

Olli S. Miettinen, M.D., M.P.H., M.SC., PH.D., Associate Professor of Epidemiology and Biostatistics.

*Ellen W. Jones, A.B., M.P.H., Lecturer on Biostatistics; *Assistant Director, Center for Community Health and Medical Care*

James H. Warram, Jr., S.B., M.D., S.M. IN HYG., Assistant Professor of Biostatistics

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Theodore Colton, A.B., S.M., S.D., *Associate Professor of Preventive Medicine, Harvard Medical School*

The teaching aims of the Department may be divided very generally into three categories:

First, it is essential for workers in all branches of public health to be able to draw justified conclusions from numerical data and to base logical action on these conclusions. This applies to the administrator who must evaluate problems and the results of his activities, as well as to the epidemiologist and the research worker who must apply statistical techniques to their laboratory and field problems. The required course in Biostatistics is therefore designed to give a minimum command of simple statistical methodology to all students.

Second, it is essential for field and laboratory researchers to be able to use statistical methods in planning and analyzing their experiments and problems. Elective courses are designed to provide an introduction to methodology in this area. These courses are adapted to the needs of students of this School,

* Part-time in the School of Public Health.

many of whom have broad backgrounds in biological sciences while few have extensive preparation in mathematics. A minimum of mathematical exposition is therefore included in courses intended for students in these categories. Instead the emphasis is on understanding the statistical procedures and the ability to carry out indicated analyses effectively.

Third, there is a smaller group of students particularly interested in pursuing further work along mathematical lines. Their requirements are fulfilled, on the one hand, by the provision of advanced and seminar courses in the Department; on the other, by the offerings of the Department of Statistics in the Graduate School of Arts and Sciences.

Training in the use of computing machinery and the opportunity to study computing techniques are available in the School's Health Sciences Computing Facility. Please refer to page 45 for a complete description of the Computing Facility. Teletype terminals are provided for interactive use with various time-sharing systems.

Any course in the Department is open to any student who meets the prerequisites stated in the course description.

Biostatistics 101a,b. Principles of Biostatistics

Lectures. *Two one-hour sessions each week, first and second periods.*

Laboratory. *One three-hour session each week, first and second periods.* Staff of the Department.

Credit 3.5 units.

Lectures and laboratory exercises introduce the student to demographic concepts: the structure of the population and the use of the life table; the nature and composition of rates and their use from administrative and epidemiological points of view. The course forms an introduction to the theory of measurements and distributions, including the testing of significance of differences and the interaction of variables. Finally, the student is introduced to basic concepts of probability and association, sampling techniques and construction of controlled experiments such as clinical trials.

Biostatistics 202c,d. Statistical Methods in Research

Lectures, discussions and laboratory. *Two three-hour sessions each week, third and fourth periods.* Dr. Reed, Dr. Worcester and Dr. Drolette.

Credit 5 units.

This course, a continuation of Biostatistics 101a,b, introduces the student to technical statistical procedures important in problems of laboratory and field research. Topics included are further considerations of probability and correlation, together with an introduction to procedures used in the planning of experiments, including variance analysis, non-parametric methods, dosage response and maximum likelihood.

Prerequisites: Basic preparation in statistics and epidemiology.

Biostatistics 203c,d. Mathematical Foundations of Biostatistics

Lectures. *One two-hour session each week, third and fourth periods. Time to be arranged.* Dr. Drolette.

Credit 2.5 units.

The material covered includes mathematical descriptions of commonly used distributions, standard procedures for estimating the moments of a distribution and mathematical foundations of statistical inference, including the Neyman-Pearson lemma, the likelihood ratio, the central limit theorem and power.

Prerequisite: A course in elementary calculus.

Epidemiology and Biostatistics 204b,c,d. Design and Analysis of Epidemiologic Investigations: Applications

Tutorials and seminars. *One two-hour seminar each week second, third, and fourth periods.* Dr. Rothman and Dr. Miettinen.

Credit 2.5 or 5 units

The seminars consist of student presentations of study plans and epidemiologic data analyses, with discussion by students and faculty. The subject matter areas include etiology, clinical course and effect of intervention in human illness. Preparatory work is done under tutorial arrangements with members of the faculty. For the analyses, the emphasis will be on conceptual issues and not on execution. However, exercises will include use of computers in analysis of data.

Enrollment may be for two and one-half or five credits. Those enrolling for five credits should also be enrolled in Epidemiology 203b, or demonstrate mastery of the subject matter; these students will make several class presentations. Students may enroll for two and one-half credits with no prerequisite other than a basic understanding of the principles of epidemiology, as might be obtained from Epidemiology 201a or its equivalent. These students will make one class presentation, concentrating on a study plan of their own choice.

Epidemiology and Biostatistics 205c,d. Topics in Epidemiologic Research

Seminars. *One two-hour session each week, third and fourth periods.* Dr. MacMahon and Staffs of the Departments of Epidemiology and Biostatistics.

Credit 2.5 units.

This course is intended for students who expect to be professionally involved in the conduct of epidemiologic research — particularly in the chronic diseases. It consists of seminars on diverse topics that are not part of the basic methodology covered in other courses but relate to specific problems in design, conduct or analysis of studies. Topics include practical aspects such as patient and population sampling, factors affecting response and data

handling; special methods of analysis of time-place clustering, cyclic variation and survival; and the particular problems of distinguishing genetic and environmental components of disease etiology. Participants must have taken Epidemiology 201a and Biostatistics 101a,b, or equivalent.

Biostatistics 207c,d. Survey Research Methods in Community Health

Lectures and discussions. *Two one-hour sessions each week, third and fourth periods.* Dr. FELDMAN.

Credit 2.5 units.

Research design, sample selection, questionnaire construction, interviewing techniques, the reduction and interpretation of data, and related facets of population survey investigations are covered in this lecture and reading course. The course is focused primarily on the application of survey methods to problems of health program planning and evaluation. The treatment of methodology is sufficiently broad so as to be suitable also for students who are concerned with applications to epidemiological, nutritional or other types of survey research.

Biostatistics 210c,d. Advanced Topics in Biostatistics

Seminar. *One two-hour session each week, third and fourth periods.* Staff of the Department.

Credit 2.5 units.

The subject matter of this course varies from year to year. During the year 1972–73, Biostatistics 210c,d, will concentrate upon practical applications of multivariate statistical methods.

The course is intended primarily for students specializing in Biostatistics. Other students may be admitted by obtaining the consent of the Department.

Biostatistics 213e. Introduction to Computing

One full week is offered twice a year, one-week period between Fall and Spring terms and week following Spring term. Staff of the Health Sciences Computing Facility.

Credit 1 unit.

Lecture and laboratory exercises provide an opportunity to learn fundamental procedures in the processing of data with computers. Laboratory exercises are conducted using equipment in the Health Sciences Computing Facility.

Biostatistics and Health Services Administration 216c,d. Health Program Evaluation

Seminars and Tutorials. *One two-hour seminar in first week of third period; weekly tutorial group meetings for remainder of third period; one*

two-hour seminar each week, fourth period. Mr. Frazier, Dr. Densen, Dr. Feldman, Mrs. Jones and Dr. Reed.

Credit 2.5 units.

This course is designed for students interested in the evaluation of ongoing health programs. After an introduction to the literature on evaluation methods, students are assigned to groups, each of which designs an evaluation proposal for a specific health program. During the fourth period seminars, these proposals are presented and critically analyzed by the students.

Biostatistics 310–315a,b,c,d. Tutorial Programs

Time and credit to be arranged. Staff of the Department.

An opportunity for tutorial work at the Master's level is offered for interested and qualified students or small groups of students. Arrangements must be made with individual faculty members and are limited by the amount of faculty time available. These tutorial programs are open to students specializing in Biostatistics and also to students in other fields who wish to go beyond the content of the regular courses. Six broad categories of this tutorial instruction are identified by the six course numbers below.

310 *Tutorial in Statistical Methods.*

Guided study in specific areas of statistical methodology and application.

311 *Tutorial in Teaching.*

Work with the Department in laboratory instruction and the development of teaching materials.

312 *Tutorial in Consultation.*

Work with members of the Department on current statistical consultation activities.

313 *Tutorial in Computing.*

Guided study in scientific programming, numerical methods and data management.

314 *Tutorial in Study Design.*

Guidance in developing statistical design of a study in which the student has a particular interest.

315 *Tutorial in Data Analysis.*

Guidance in the statistical analysis of a body of data in which the student is interested.

Biostatistics 350. Research

Candidates for the Doctors of Public Health, Doctor of Science or other doctoral degrees may arrange for individual research. The work may be part of the program for a doctorate in this Department or may be integrated with doctoral research in other departments.

Students may register for Biostatistics 310–315 for a maximum of ten credit units in the summer term.

Environmental Health Interdepartmental Courses

The following courses are conducted by the Faculty and Staff of The Kresge Center for Environmental Health which includes the Departments of Environmental Health Sciences, Physiology, and Sanitary Engineering.

Environmental Health Interdepartmental 201a, 201b. Principles of Environmental Health

Lectures, discussions and tours. *Two one-hour sessions and one two-hour session each week, first and second periods.* Dr. MOELLER and Staff of the Center.

Credit 2 units in each period.

The purpose of this course is to review some of the more important problems associated with man and his environment. Although the sources, biological effects, and control of various environmental stresses are considered on an individual basis, major emphasis is on dealing with environmental health problems as a totality. Included within the course is a series of Case Studies in which participants are provided an opportunity to discuss in depth on a small group basis several of the more controversial subjects within environmental health. Supplementing the lectures are on-site visits to provide students with knowledge of the operation of water purification and waste treatment facilities, solid waste handling procedures, industrial medical programs, and activities within a radiological health research and monitoring laboratory.

The course schedule has been arranged so that Master of Science candidates may elect either the first or second period to obtain coverage of specific topics. Subjects presented during the "a" period include water purification and waste water treatment, rural sanitation, management of solid wastes, accident prevention, and noise and other physical stresses. Subjects presented during the "b" period include air pollution, ionizing and non-ionizing radiation, occupational health, toxicology, and environmental and respiratory physiology.

Environmental Health Interdepartmental 202c,d. Community Environmental Health Management

Lectures, discussions, and role playing. *One three-hour session each week, third and fourth periods.* Dr. MOELLER and Staff of the School of Public Health.

Credit 2 units.

Will not be given in 1972–73.

This is a computerized game which simulates a metropolitan environment

by including a basic set of data on such factors as air pollution characteristics, employment, land use, and public services. The data are organized into models which show the inter-relationships of these factors in the life of a community. Through playing roles such as those of air pollution control officers, politicians, town planners, industrialists, and land developers, students are given the opportunity to make decisions on issues raised by those living in and making up the community. Such decisions include those on annual budgets and tax rates as well as those related to problems arising out of the changing environment. The impact of the actions of the students is obtained by feeding into a computer their decisions coupled with overall data on the hypothetical community. The computer then evaluates the effects of their actions on the community and presents the data in summary form for follow-up action by game participants. The course has proven particularly effective as a means of providing students experience in applying information and techniques gained in a variety of courses offered at the School of Public Health.

Enrollment will be limited to 60 students.

Environmental Health Interdepartmental 203a,b,c,d. Principles of Aerospace Health and Safety

Seminars. *One two-hour session each week, first, second, third and fourth periods.* Dr. Dougherty and Dr. Leith.

Credit 5 units.

In this course principles of aerospace medicine are presented as they relate to maintenance of peak health and performance in individuals exposed to physical, chemical and biological stress. Emphasis will be placed upon the application of knowledge from the field of aerospace medicine toward environmental hazards common to the community.

Attention will be drawn to the historical development of the field of environmental health and its effect on continuing research and control measures. Topics include but are not limited to, acceleration, impact, noise, exercise and energy exchange, adverse temperature, humidity, circadian rhythms, altitude and diving. Methods of measurement and prediction of physiologic and psychologic performance are reviewed. Established associations between environmental stress and harmful effects are compared to accepted safe limits and limiting mechanisms for human tolerance. The scientific validity of the accepted safe limits is explored.

Students in the course have the option of tutorial participation in the Logan Airport Medical Station of the Massachusetts General Hospital. Non-physicians may participate at the airport in the field of industrial hygiene. Prerequisite — Physiology 203a,b, or equivalent training.

Enrollment is subject to the approval of the Instructor.

Environmental Health Interdepartmental 204c,d. Human Factors in Occupational Performance and Safety

Lectures and demonstrations. *One two-hour session each week, third and fourth periods.* Dr. STOUDT.

Credit 2 units.

This course considers ways in which occupational performance and safety can be improved through the application of human factors engineering, or biotechnology. Materials from experimental psychology, applied physiology, and physical anthropology are related to the design of the task, the workspace, and the working environment. Consideration is given to the matching of human physical and psychological capabilities and limitations to job requirements and workspace characteristics, including the effects of fatigue, aging, and various environmental stresses. Special treatment is given to the analysis and prevention of occupational, transportation, and home accidents through the application of a multi-disciplinary human factors approach.

Environmental Health Interdepartmental 206c,d. Occupational Medical Clinics

Clinics, Massachusetts General Hospital. *One two-hour session each week, third and fourth periods.* Dr. PETERS and Dr. MURPHY.

Credit 2 units.

These clinics are concerned with diseases due to occupation, such as silicosis, beryllium intoxication, coal miner's pneumoconiosis, and lead poisoning. Special clinics are held in ophthalmology and dermatology.

The clinics are limited to physicians and are not offered if less than four students enroll.

Environmental Health Interdepartmental 207c,d. Occupational Medicine

Lectures and seminars. *One two-hour session each week, third period; two two-hour sessions each week, fourth period.* Dr. PETERS, Dr. WILKINS, and Dr. TYLER.

Credit 3 units.

This course considers the traditional administration and organization of occupational medical departments. Standard practices of screening, physical exams and record keeping will be presented. Problems of absenteeism and alcoholism will be discussed.

In addition consideration will be given to federal, state and municipal programs in occupational health and how current legislation may affect them.

The worker's view of occupational health and safety will also be presented. Other topics covered will be multiphasic screening and telediagnosis as they apply to occupational medicine.

This course will be limited to physicians and will not be offered if less than four enroll.

Environmental Health Interdepartmental 208a,b. Operations Research in Environmental Health Engineering

Lectures and computer exercises. *Three hours each week, first and second periods; time to be arranged.* Dr. HARRINGTON.

Credit 3 units.

This course is an introduction to the concepts and techniques of operations research, applied to problems of environmental health sciences and engineering. Topics include the following: several interrelated mathematical techniques of optimization — Lagrangian methods, steepest descent, linear, nonlinear and dynamic programming, approximation theory; systems analysis of air and water treatment and solid waste disposal practices; applications of queueing theory, Markov processes, and statistical decision theory.

Prerequisite: Mathematics 20b (Differential Equations), or its equivalent, is desirable.

Enrollment is subject to the approval of the Instructor.

Environmental Health Interdepartmental 209c,d. Mathematical Modelling for Health Sciences

Lectures and discussions. *Three one-hour sessions each week, third period; two two-hour sessions, fourth period.* Dr. DAWSON.

Credit 4 units.

The primary purpose of the course is to develop the student's skill in applying basic mathematics to the formulation of quantitative problems in the health sciences. After a review of the necessary elementary concepts of algebra and calculus, the basic techniques for trajectory solution of ordinary differential equations will be developed.

Mathematical concepts and techniques will be taught in the context of modelling examples from population sciences, including ecology, and the bio-physical sciences, including physiology. The emphasis will be on the mechanistic rather than the phenomenological aspects of modelling. Probabilistic, as well as deterministic, models will be discussed.

In the fourth period, members of the class may devote their primary attention to one of the projects to be offered.

Prerequisite: Elementary calculus.

This course will not be offered if less than four enroll.

Environmental Health Interdepartmental 330e. Field Work

Credit 1 unit.

A week of supervised field observation is offered during the one-week period between Fall and Spring terms. Students may choose appropriate visits to medical or industrial hygiene departments of industries, airports,

and other agencies which have operations or research in the field of environmental health.

The following courses are offered in the General Education program in Harvard College by members of The Kresge Center for Environmental Health. They are open to properly qualified students in the School of Public Health.

Consult the catalogue of the Faculty of Arts and Sciences for complete descriptions of these courses.

Natural Sciences 115. Models for the Control of Man's Physical Environment

Half course (*fall term*). *M., W., F. at 9.* Associate Professor HARRINGTON and Assistant Professor ROGERS.

Natural Sciences 132. Introduction to Environmental Health

Half course (*fall term*). *M. and W. at 12, and one discussion hour to be arranged.* Professor MOELLER.

[May not be taken for credit in addition to E. H. I. 201a, 201b.]

Department of Environmental Health Sciences

Dade W. Moeller, s.b., s.m., ph.d., a.m. (hon.), Professor of Engineering in Environmental Health, Head of the Department *and* Associate Director, Kresge Center for Environmental Health

*Melvin W. First, s.b., s.m., s.d., Professor of Environmental Health Engineering

William A. Burgess, s.b. in mech.eng., s.m., Associate Professor of Environmental Health and Safety Engineering; *Consultant on Environmental Health and Safety, University Health Services*

*Richard Dennis, s.b., s.m., Associate Professor of Applied Environmental Health Engineering; *Director, Pollution Control Laboratory, G.C.A. Corporation, Bedford*

Abraham S. Goldin, a.b., a.m., ph.d., Associate Professor of Environmental Chemistry

James R. Mahoney, s.b., ph.d., Associate Professor of Applied Meteorology

Parker C. Reist, s.b., s.m., s.m. in hyg., s.d. in hyg., Associate Professor of Environmental Health Engineering (Absent 1972–73)

*George F. Wilkins, a.b., m.d., Associate Clinical Professor of Occupational Medicine

*Bengt E. Bjarngard, m.sc., d.sc., Lecturer on Medical Radiation Physics; *Assistant Professor of Radiation Therapy, Harvard Medical School*

*Allen L. Cudworth, s.b. in e.e., s.m. in e.e., s.d. in hyg., Lecturer on Applied Acoustics and Environmental Health; *Vice President of Liberty Mutual Life Insurance Companies and Director, Research Center*

†Jacob Shapiro, s.b., s.m., ph.d., Lecturer on Biophysics in Environmental Hygiene; *Radiological Health and Safety Engineer, University Health Services*

*Edward W. Webster, b.sc., ph.d., Lecturer on Medical Radiation Physics; *Associate Professor of Radiology, Harvard Medical School*

Dwight W. Underhill, b.e., s.m. in hyg., s.d. in hyg., Assistant Professor of Environmental Health Engineering

*David M. Anderson, s.b., in chem. e., ph.d., Visiting Lecturer on Industrial Hygiene Engineering; *Manager, Environmental Quality Control, Bethlehem Steel Corporation*

* Part-time in the School of Public Health.
† Part-time in the School of Public Health, full-time in Harvard University.

*James M. Austin, b.a., m.a., s.d., Visting Lecturer on Meteorology and Air Pollution; *Professor of Meteorology, Massachusetts Institute of Technology*

*John K. Dane, a.b., ll.b., ll.m., Visiting Lecturer on Workmen's Compensation; *Counsel, Liberty Mutual Insurance Companies*

*Horace W. Gerarde, s.b., s.m., m.d., ph.d., Visiting Lecturer on Industrial Toxicology; *Corporate Medical Director — Occupational Health, Becton, Dickinson and Company*

*Nathan Van Hendricks, b.e., chem.e., Visiting Lecturer on Industrial Hygiene Engineering; *Assistant Director for Environmental Sciences, Standard Oil Company (New Jersey)*

*John H. Ludwig, s.b., s.m., s.m. in hyg., s.d. in hyg., Visiting Lecturer on Community Air Pollution

*John A. Naegele, s.b., ph.d., Visiting Lecturer on Community Air Pollution; *Head, Department of Environmental Sciences, University of Massachusetts*

*Kenneth W. Nelson, ed.b., s.m., Visiting Lecturer on Environmental Health; *Director, Department of Environmental Sciences, American Smelting and Refining Company*

*Robert B. O'Connor, a.b., m.d., Visiting Lecturer on Occupational Medicine; *Vice President, Personnel and Health Services, U. S. Steel Corporation, (Pennsylvania)*

*Harry F. Schulte, b.chem.eng., s.m., Visiting Lecturer on Environmental Health Engineering; *Group Leader, Industrial Hygiene Group, Los Alamos Scientific Laboratory, New Mexico*

*Frederick J. Viles, Jr., s.b., s.m., Visiting Lecturer on Industrial Hygiene

*Oliver L. Welsh, s.b., a.m., ed.d., Visiting Lecturer on Audiology; *Chief Audiologist, Veterans Administration Clinic, Boston*

*Robert E. Zimmerman, b.e.e., s.m., Visiting Lecturer on Medical Radiological Physics; *Associate in Radiology, Harvard Medical School*

Robert G. Gould, a.b., s.m.e., Teaching Fellow in Environmental Health Sciences

Peter J. Knapp, s.b., s.m. in hyg., Teaching Fellow in Environmental Health Sciences

William V. Lipton, s.b., s.m., s.m. in env. h., Teaching Fellow in Environmental Health Sciences

Eugene F. Mallove, s.b., s.m., Teaching Fellow in Environmental Health Sciences

Douglas G. Smith, s.b., s.m. in hyg., Teaching Fellow in Environmental Health Sciences

Ray C. Woodcock, A.B., S.M. IN ENV. H., Teaching Fellow in Environmental Health Sciences

Otto Grubner, PH.D., Research Associate in Environmental Chemistry

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Stanley J. Adelstein, S.B., S.M., M.D., PH.D., *Professor of Radiology, Harvard Medical School*

Because of the growing public awareness of the need for environmental pollution control and worker protection, an increasing amount of attention is being focused on these problems at all levels of our society. At the Harvard School of Public Health, research and training have been conducted on these subjects since 1926. Applicable curricula offered by the Department of Environmental Health Sciences include Air Pollution Control, Radiological Health, and Industrial Hygiene. These programs are open to engineers, physicians, and other professional personnel with undergraduate backgrounds in physics, chemistry, and biology.

Graduate training in each of the fields covered by the Department includes courses on human physiology, epidemiology and biostatistics. Typical courses selected as electives in the several options may be as follows:

Air Pollution Control

Community Air Pollution (Environmental Health Sciences 261a,b)
Meteorological Aspects of Air Pollution (Environmental Health Sciences 262a,b)
Identification and Measurement of Air Contaminants (Environmental Health Sciences 264c,d)
Air and Gas Cleaning (Environmental Health Sciences 265c,d)
Aerosol Technology (Environmental Health Sciences 253a,b)
Principles of Toxicology (Physiology 205c, 205d)

Industrial Hygiene

Basic Problems in Occupational Health and Industrial Environments (Environmental Health Sciences 251c,d)
Environmental Control (Environmental Health Sciences 252c, 252d)
Human Factors in Occupational Performance and Safety (Environmental Health Interdepartmental 204c, 204d)
Environmental Physiology (Physiology 204c)
Identification and Measurement of Air Contaminants (Environmetal Health Sciences 264c,d)
Air and Gas Cleaning (Environmental Health Sciences 265c,d)
Principles of Toxicology (Physiology 205c, 205d)
Aerosol Technology (Environmental Health Sciences 253a,b)

Radiological Health

Introduction to Radiation Protection (Environmental Health Sciences 271a,b)
Radiation Biology (Physiology 207c,d)
Radiation Protection Engineering (Environmental Health Sciences, 272a,b)
X-ray Protection (Environmental Health Sciences 274c,d)
Aerosol Technology (Environmental Health Sciences 253a,b)
Problems in Radiation Dosimetry (Environmental Health Sciences 273c,d)

Supporting the teaching program are extensive research activities. Current studies include an evaluation of performance factors for respirators and gas masks, assessment of the environmental impact of nuclear facilities, medical radiation applications and dosimetry, the design of cleanup systems for radioactive sodium aerosols, the application of gas- and liquid-phase reactions to particulate and gas removal, a numerical study of urban scale atmospheric transport, the monitoring of worker stresses by telemetered physiological measurements, and an investigation of the population dose from radiation of natural origin. Supporting these studies are related cooperative research projects conducted by the Departments of Physiology and Epidemiology. As a result, students have many excellent opportunities for research, either on an independent basis or as a participant in an ongoing project.

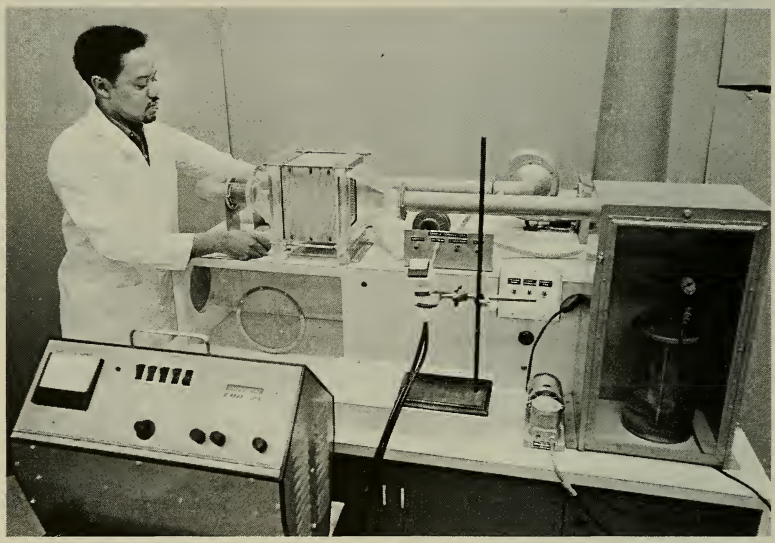
As may be noted, some of the courses in this Department carry "Engineering" numbers. These are cross listed in the catalog of the Division of Engineering and Applied Physics in Cambridge and provide course credit through that Division as well as the School of Public Health.

Environmental Health Sciences 202a,b,c,d. Departmental Seminar

Seminars. *One one-hour session each week, first, second, third and fourth periods.* Staff of the Department.

Credit 2 units.

The purpose of these seminars is to supplement the formal course work of the Department of Environmental Health Sciences by bringing to the attention of the students a wide range of topics of contemporary interest in air pollution control, industrial hygiene, and radiological health. Initial sessions are led by faculty members of the Kresge Center for Environmental Health and cover current research activities within the Center. Subsequent sessions include critical reviews of assigned subjects by students within the Department. Such reviews will be evaluated on the basis of the student's ability to digest and present information on a given topic in an orderly fashion, as well as his ability to evaluate published research papers from the standpoint of the significance of the study, the experimental method, evaluation of the results, and organization of the manuscripts. During other portions, the



This unit demonstrates the application of high efficiency particulate filters for atomic engineering installations.

seminars will be led by specialists from other parts of the University and from industrial, governmental, and university research centers.

Environmental Health Sciences 251c,d. Basic Problems in Occupational Health and Industrial Environments (Engineering 282)

Lectures. *Two two-hour sessions each week, third and fourth periods.*

Laboratory demonstrations and field trips. *One three-hour session each week, third and fourth periods.* Dr. Ferris, Dr. First, Dr. Peters, and Mr. Burgess.

Credit 5 units.

A course of lectures, laboratory demonstrations and inspections of work places showing the relation of working conditions to health with special reference to control of industrial hazards. Examples include adverse conditions of temperature, humidity, radiation, and chemical and physical irritants. Particular emphasis is given to the prevention, diagnosis, and treatment of industrial disability and disease, and to workmen's compensation.

Prerequisite: Physiology 203a,b.

Environmental Health Sciences 252c, 252d. Environmental Control (Engineering 280)

Lectures. *Two one-hour sessions each week, third and fourth periods.*

Laboratory. *One three-hour session each week, third and fourth periods.* Mr. Burgess and Dr. Cudworth.

Credit 2.5 units in each period.

To be given in 1972–73; will not be given in 1973–74.

The operations and processes used in modern industry may release toxic fumes, gases, mists, and vapors to the workplace. The most important control measure for such airborne contaminants is exhaust ventilation. The first half of this course includes lectures and laboratory topics in the design and evaluation of industrial ventilation systems. Lecture topics include flow of fluids, principles of hood and duct design, fans and blowers, and special topics such as make-up air systems and air conditioning fundamentals. Laboratory sessions include calibration of air flow measuring instruments and their use in evaluating systems, performance studies of hood and air movers in the laboratory and industrial plants, and a major ventilation design problem.

The second half of the course is designed for the environmental health specialist who will have responsibility for the evaluation and control of noise hazards. Topics covered include sound generation and propagation, measurements and instrumentation, transmission and absorption, and specific control approaches for production equipment, air movers, and hydraulic systems. Laboratory sessions will provide the student with practical experience in the evaluation of sound sources and the prediction of noise hazards. Useful control techniques will be demonstrated and evaluated in order to provide a systematic approach to noise reduction and hazard elimination.

Environmental Health Sciences 253a,b. Aerosol Technology (Engineering 286)

Lectures. *Two one-hour sessions each week, first and second periods.*

Laboratory. *One two-hour session each week, first period; one four-hour session each week, second period.* Staff of the Department.

Credit 5 units.

This course deals with the properties of particulate clouds and the physical principles underlying their behavior, including aerosol measurement. Topics include individual particle trajectories, diffusion, condensation and evaporation, electrical and optical properties, and coagulation, as well as the behavior of the cloud *in toto*.

Environmental Health Sciences 261a,b. Community Air Pollution*

Lectures, demonstrations, and seminars. *One two-hour session each week, first and second periods.* Dr. First and Staff of the Center.

Credit 2.5 units.

This lecture and seminar course is designed for engineers, chemists, and physicians interested in air pollution control. Topics presented include the measurement and control of community air pollution; air quality standards; health effects of air pollution; damage to animals, plants and property; community and site surveys; the legal and enforcement aspects of air pollution control; and the nature and quantity of atmospheric emissions from transportation vehicles, municipal incinerators and specific industries.

Environmental Health Sciences 262a,b. Meteorological Aspects of Air Pollution*

Lectures and demonstrations. *One two-hour session each week, first and second periods.* Dr. Mahoney.

Credit 2.5 units.

This course presents an evaluation of the meteorological factors associated with the transport of air pollutants. Topics include the properties of the atmosphere near the ground, turbulent dispersion of pollutants, instrumentation for evaluating the movement and behavior of air pollutants, atmospheric diffusion equations, diffusion from single and area sources, and mathematical models for evaluating urban air pollution. Applications of meteorological theory to air pollution phenomena are emphasized through demonstrations and the assignment of specific problems.

Admission is subject to the approval of the Instructor.

Environmental Health Sciences 264c,d. Identification and Measurement of Air Contaminants (Engineering 283)

Lectures. *Two one-hour sessions each week, third and fourth periods.*

Laboratory. *One three-hour session each week, third and fourth periods.* Staff of the Department.

Credit 5 units.

This course emphasizes sampling and analytical methods for air contaminants plus related subjects. Included are chemical and instrumental methods of air analysis, isokinetic sampling, biological and solvent analysis, radioactive aerosol determinations, air pollution surveys, and fire and explosion evaluations.

This course is intended for air analysts, engineers and physicians. It is recommended for all students pursuing programs in Industrial Hygiene and

* These two courses constitute Engineering 284.

Air Pollution Control and suggested for students in the Radiological Health and the Master of Industrial Health Programs.

Environmental Health Sciences 265c,d. Air and Gas Cleaning

Lectures. *One two-hour session each week, third and fourth periods.*

Laboratory. *One two-hour session each week, third and fourth periods.* Dr. First and Staff of the Department.

Credit 5 units.

Theory, selection, application, and testing of air and gas cleaning devices. The topics covered include absorption of gases in liquids and adsorption on solids, gas incineration, particle collection by inertial and centrifugal force, filtration, electrostatic precipitation, and scrubbing, with special emphasis on the basic processes of particle conditioning. Laboratory experiments and case studies will be used to illustrate important aspects of equipment sizing and correct equipment selection. Application of techniques for sampling and analysis of aerosols and gas streams up- and downstream of gas cleaning devices will form an important part of the laboratory instruction. Teaching will be by a combination of formal lectures, group discussions, laboratory experiments, problem solving, and case studies.

Prerequisites: Environmental Health Sciences 253a,b, and Environmental Health Sciences 264c,d. (May be taken simultaneously.)

Environmental Health Sciences 271a,b. Introduction to Radiation Protection (Engineering 288)

Lectures. *Two one-hour sessions each week, first and second periods.*

Laboratory and field trips. *One three-hour session each week, first and second periods.* Dr. Goldin.

Credit 5 units.

This course is an introduction to the health and safety problems accompanying the use of particulate and electromagnetic radiation. Lecture topics include the elements of radioactivity; interaction of radiation with matter; methods for radiation protection; radiation protection standards; and the major sources of population exposure including natural background, x-radiation, nuclear power, electronic products, and microwave and laser applications. Classroom work includes assigned readings on radiation protection guides and the public health implications of nuclear facilities and radionuclide applications. Laboratory exercises provide an introduction to radiation sources, their measurement, and safe use.

Environmental Health Sciences 272a,b. Radiation Protection Engineering (Engineering 287)

Lectures. *Two two-hour sessions each week, first and second periods.* Dr. Shapiro.

Credit 5 units.

This course covers the basic physical principles, mathematical analyses, and engineering methods utilized in the evaluation and control of radiation hazards. The material is developed through consideration of radiation protection problems of nuclear power reactors, radiation-producing machines, and radiochemical laboratories. Topics covered include: neutron slowing and diffusion; nuclear reactor theory; criticality safeguards; radiation shielding; in-plant radiation protection; and analysis of environmental hazards.

Enrollment is subject to the approval of the Instructor.

Environmental Health Sciences 273c,d. Problems in Radiation Dosimetry

Lectures. *Two one-hour sessions each week, third and fourth periods.* Laboratory, *One three-hour session each week, third period.* Dr. SHAPIRO.

Credit 4 units.

Will not be given in 1972–73.

This course deals with the experimental and theoretical methods of evaluating radiation fields and determining radiation dose rates. Special dosimetry problems for study in the laboratory are selected from the fields of health physics, nuclear engineering, and nuclear medicine.

Prerequisite: Environmental Health Sciences 271a,b.

Environmental Health Sciences 274c,d. X-ray Protection

Lectures. *One two-hour session each week, third and fourth periods.*

Laboratory. *One four-hour session each week, third and fourth periods. Time to be arranged.* Dr. WEBSTER.

Credit 5 units.

To be given in 1972–73; will not be given in 1973–74.

This course covers the fundamentals of X-ray equipment (both industrial and medical), the design of X-ray installations, and procedures for radiation protection surveys and inspections. Considerations include both equipment and room design with emphasis on such items as leakage, collimation, filtration, primary and secondary barriers, workload, and protection of patients. X-ray measuring instruments are evaluated with respect to their use and calibration as well as to performance characteristics such as time response, energy dependence and directional dependence. Included in the course are several problem assignments ranging from the design of individual protective components up to, and including, the design of a complete protective installation.

Environmental Health Sciences 275c,d. Measurement and Applications of Radionuclides

Lectures. *One one-hour session each week, third and fourth periods.*

Laboratory. *One three-hour session each week, third and fourth periods.* Dr. Goldin and Dr. Adelstein.

Credit 3 units.

To be given in 1972–73; will not be given in 1973–74.

This course presents the fundamentals of radionuclide techniques for application to research problems in medicine, biology, and environmental control. Topics covered include the theory and practice of radionuclide identification and measurement, sampling and sample preparation, and radiochemical separations. Auxiliary techniques considered include activation analysis, production of short-lived nuclides, and isotope "milking." Laboratory sessions are arranged to permit an option so that students can perform experiments on either biochemical tracer applications or environmental radioactivity.

This course is intended for students and research workers in the medical and biological sciences or environmental health. Previous training or experience with radioactive materials is not required.

Environmental Health Sciences 301–305a,b,c,d,e. Tutorial Programs

Reading or Research. *Time and credit to be arranged.*

Reading or research assignments for individual tutorial work at a Master's degree level are provided for qualified students in the fields of industrial hygiene, industrial ventilation, aerosol technology, radiological hygiene, medical radiation physics, nuclear medicine, solid waste management and air pollution control.

301 *Air Pollution*, Dr. First and Dr. Mahoney.

302 *Industrial Hygiene*, Mr. Burgess.

303 *Radiological Health*, Dr. Goldin, Dr. Moeller and Dr. Shapiro.

304 *Medical Physics*, Dr. Bjarngard and Dr. Webster.

305 *Solid Wastes*, Dr. First.

Enrollment is subject to the approval of the Head of the Department.

Environmental Health Sciences 350–359. Research

Facilities of the Department are available for doctoral candidates and properly qualified second year master's degree students to pursue independent research on problems in industrial hygiene, aerosol technology, solid waste management, air pollution control and radiological health. Areas currently receiving study in the Department are as follows:

351 Evaluation of performance factors of respiratory protective devices; monitoring exposures of occupational groups to toxic air contaminants; ventilation control of airborne contaminants; evaluation and control of noise (Mr. Burgess).

352 Application of gas- and liquid-phase reactions to particulate and gas removal; development and design of cleanup systems for airborne contaminants from industrial and nuclear power plant facilities; incineration of solid wastes including municipal, radioactive, biological and laboratory materials (Dr. First).

353 Measurement and control of environmental radiation; application of radiation and radioactive materials to environmental health problems; radiation safety in the use of nuclear energy (Dr. Goldin).

354 Computer modelling of pollutant transport in urban atmospheres; analysis of air quality data derived from sampling networks; meteorology of urban areas (Dr. Mahoney).

355 Reduction of population dose from sources of natural origin; environmental protection for nuclear facilities; radiation safety criteria and standards (Dr. Moeller).

356 Sampling and analysis of aerosol particles both in the ambient atmosphere and under laboratory conditions; generation of monodisperse aerosols; uses of aerosols in environmental health; development of particulate removal equipment.

357 Evaluation and control of hazards from radioactive contamination; dosimetry of radiation from high energy accelerators (Dr. Shapiro).

358 Medical radiation physics with emphasis on dosimetry, nuclear medicine and radiation therapy (Dr. Bjarngard).

359 Medical radiation physics with emphasis on survey techniques, instrumentation, and image quality and patient dose reduction in diagnostic radiology (Dr. Webster).

Enrollment is subject to the approval of the Head of the Department.

Department of Epidemiology

Brian MacMahon, M.B., Ch.B., D.P.H., Ph.D., S.M. in Hyg., M.D., Professor of Epidemiology *and* Head of the Department

George B. Hutchison, A.B., M.D., M.P.H., Professor of Epidemiology

Jane Worcester, A.B., Dr.P.H., S.D. (hon.), Professor of Biostatistics and Epidemiology

*Thomas F. Pugh, M.D., M.P.H., Associate Professor of Applied Epidemiology; *Director, Evaluation, Research and Statistics, Massachusetts Department of Mental Health*

Ascher J. Segall, M.D., M.P.H., Dr.P.H., Associate Professor of Epidemiology

Olli S. Miettinen, M.D., M.P.H., M.Sc., Ph.D., Associate Professor of Epidemiology and Biostatistics

Philip T. Cole, A.B., M.D., M.P.H., Dr.P.H., Associate Professor of Epidemiology

Thomas M. Mack, A.B., M.D., M.P.H., Assistant Professor of Epidemiology

Richard R. Monson, S.B., M.D., S.M. in Hyg., S.D. in Hyg., Assistant Professor of Epidemiology

Kenneth J. Rothman, A.B., D.M.D., M.P.H., Dr. P.H., Assistant Professor of Epidemiology

Stella B. Yen, M.D., M.P.H., Research Associate in Epidemiology

*Robert W. Miller, A.B., M.D., M.P.H., Dr.P.H., Visiting Lecturer on Epidemiology; *Chief, Epidemiology Branch, National Cancer Institute*

*Ralph S. Paffenbarger, Jr., A.B., B.M., M.D., Dr.P.H., Visiting Lecturer on Epidemiology; *Chief, Bureau of Chronic Diseases, California Department of Public Health, Berkeley*

*Emilio C. Venezian, B.Eng., S.M., Ph.D., Lecturer on Epidemiology; *Member, Operations Research Section, Arthur D. Little, Inc., Cambridge*

Richard K. Donelson, M.D., M.P.H., Teaching Fellow in Epidemiology

Kamal T. Abou-Daoud, M.D., D.T.M. & H., S.M. in Hyg., Senior Research Fellow in Epidemiology

Kenneth K. Nakano, A.B., M.D., M.P.H., S.M. in Epid., Research Fellow in Epidemiology

Raymond R. Neutra, A.B., M.D., M.P.H., Research Fellow in Epidemiology

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Hermann Lisco, M.D., *Lecturer on Pathology and Associate Dean for Student Affairs, Harvard Medical School*

Frank E. Speizer, A.B., M.D., *Assistant Professor of Medicine, Harvard Medical School*

* Part-time in the School of Public Health.

The major objective of the Department of Epidemiology is to provide opportunities for training and experience in the application of epidemiologic research methods to the investigation of diseases of unknown etiology. Emphasis is on the cardiovascular and mental disorders, the malignant neoplasms, abnormalities of reproduction and development, and other major diseases for which preventive measures are still unknown or inadequate.

A one-year research-training program leads to the degree of Master of Science in Epidemiology. This program includes most of the courses listed below, except for Epidemiology 202c which is intended for students whose primary interest is something other than epidemiology, plus Biostatistics 101a,b, 202c,d, and 213e — a total of between 25 and 30 credit units. The remainder of the credits required for the degree may be taken as additional formal courses in areas of special interest, or as supervised research (Epidemiology 300a,b,c,d).

For qualified students the period of research training may be extended by admission to either of the doctoral programs offered by the School, by admission to special student status, or through other individual arrangements. Most of the training period beyond the master's degree is occupied in supervised research experience. Potential doctoral candidates must plan at least two years in residence beyond completion of the master's degree.

A three-year residency in the Department of Epidemiology has been approved as satisfying residency requirements of the American Board of Preventive Medicine for certification in General Preventive Medicine. Requirements of the approved residency and of the School's degree programs may be satisfied simultaneously.

Fellowships for research training programs are provided in U.S. Public Health Service training grants to the Department. The Public Health Service also has a program of traineeship grants for support of residents in approved preventive medicine residencies. Traineeships from these sources are restricted to U.S. citizens or physicians who have been admitted to the United States for permanent residence. Applications should be submitted through the Department of Epidemiology.

Epidemiology 201a. Principles of Epidemiology

Lectures, laboratories, and seminars. *Two two-hour sessions each week, first period.* Dr. Monson and Dr. Mack.

Credit 2.5 units.

Lectures, laboratory work and seminars on the purposes, principles and methods of epidemiology, defined as the study of the distribution and determinants of disease frequency in man. The principles discussed serve as an introduction to many aspects of the prevention and control of disease in populations. Illustrations include classic and contemporary studies of acute and chronic disease.

Epidemiology 202c. Epidemiologic Workshop

Seminars. *One two-hour session each week, third period.* Dr. MACK and Dr. MONSON.

Credit 1 unit.

This course is for students whose primary interest is something other than epidemiology, but who intend to apply epidemiologic principles in their field. Participants will select topics of interest to them and will design studies testing useful hypotheses. These studies will be discussed in class by faculty and students. Emphasis will be placed upon the development of simple designs in different subject areas rather than of more complex study designs and analyses. Participants must have taken Epidemiology 201a and Biostatistics 101a,b, or have equivalent background.

Epidemiology 203b. Design and Analysis of Epidemiologic Studies: Principles

Lectures. *Two two-hour sessions each week, second period.* Dr. MIETTINEN and Dr. ROTHMAN.

Credit 2.5 units.

The course is for students who expect to be involved in the planning, conduct or analysis of etiologic or intervention studies in human illness. It is required of students concentrating in epidemiology, but it also serves the needs of students majoring in other areas. Prerequisites for the course are familiarity with first principles of epidemiology and biostatistics. These may be met by the completion of Epidemiology 201a and enrollment in Biostatistics 101a,b, or by the demonstration of equivalent background.

The main emphasis in the course is on the means of attempting to provide for valid causal inferences, but principles of securing efficiency of investigation are also considered. The topics covered include measures of risk and effect, classification of epidemiologic studies, criteria of valid comparison, representativeness and generalizability, selection of types of subjects, randomization, matching, stratification and multivariate analysis.

Epidemiology and Biostatistics 204b,c,d. Design and Analysis of Epidemiologic Investigations: Applications

Tutorials and seminars. *One two-hour seminar each week, second, third, and fourth periods.* Dr. ROTHMAN and Dr. MIETTINEN.

Credit 2.5 or 5 units.

The seminars consist of student presentations of study plans and epidemiologic data analyses, with discussion by students and faculty. The subject matter areas include etiology, clinical course and effect of intervention in human illness. Preparatory work is done under tutorial arrangements with members of the faculty. For the analyses, the emphasis will be on con-

ceptual issues and not on execution. However, exercises will include use of computers in analysis of data.

Enrollment may be for two and one-half or five credits. Those enrolling for five credits should also be enrolled in Epidemiology 203b, or demonstrate mastery of the subject matter; these students will make several class presentations. Students may enroll for two and one-half credits with no prerequisite other than a basic understanding of the principles of epidemiology, as might be obtained from Epidemiology 201a or its equivalent. These students will make one class presentation, concentrating on a study plan of their own choice.

Epidemiology and Biostatistics 205c,d. Topics in Epidemiologic Research

Seminars. *One two-hour session each week, third and fourth periods.* Dr. MacMahon and Staffs of the Departments of Epidemiology and Biostatistics.

Credit 2.5 units.

This course is intended for students who expect to be professionally involved in the conduct of epidemiologic research — particularly in the chronic diseases. It consists of seminars on diverse topics that are not part of the basic methodology covered in other courses but relate to specific problems in design, conduct or analysis of studies. Topics include practical aspects such as patient and population sampling, factors affecting response and data handling; special methods of analysis of time-place clustering, cyclic variation and survival; and the particular problems of distinguishing genetic and environmental components of disease etiology. Participants must have taken Epidemiology 201a and Biostatistics 101a,b, or equivalent.

Microbiology, Tropical Public Health, and Epidemiology 206d. Tuberculosis

Seminars. *One two-hour session each week, fourth period.* Dr. Morrow, Dr. Mack, Dr. Berggren and Dr. Campbell.

Credit 1 unit.

The purpose of this course is to provide an understanding of the ecology and the public health significance of tuberculosis. Emphasis is on tuberculosis control in the less-developed countries. Seminars focus on the microbiological, epidemiological, cultural, and economic factors which influence the form and effectiveness of tuberculosis control. Consideration is given to methods of analyzing the costs and benefits of national tuberculosis control programs.

Epidemiology 211c,d. Epidemiology of Chronic Disease

Lectures. *One two-hour session each week, third and fourth periods.* Dr. Hutchison.

Credit 2.5 units.

This course will present a review of the present knowledge of the frequency, distribution and determinants of selected diseases. Diseases will be

selected on the basis of public health importance, availability of a substantial epidemiologic literature, or special timeliness. Included will be cardiovascular diseases, malignancy, diabetes, chronic respiratory disease, congenital malformations, arthritis, peptic ulcer, glaucoma, suicide, mental disease. For each condition the material covered will, in so far as is appropriate, include the magnitude of the problem, findings from epidemiologic studies, current understanding of etiology, and outstanding problems for study. Methodologic problems of study and limitations of available data will be discussed.

Epidemiology 212c,d. Biology and Epidemiology of Cancer

Lectures. *Two one-hour sessions each week, third and fourth periods.* Dr. Cole.

Credit 2.5 units.

This course is intended for students majoring in epidemiology, for students who anticipate a career in any aspect of cancer research or chronic disease control and for those who, for any other reason, wish to become more familiar with cancer as a public health problem. The course begins with a review of the differentiation, growth and behavior of normal and neoplastic cells. A systematic overview is then presented of virus, chemical and physical carcinogenesis and tumor biology and immunology. The major malignant diseases are then reviewed, primarily from the epidemiologic point of view. Major emphasis is placed on presentation of available and foreseeable methods of prevention and early disease detection. Effort is made to integrate information from the relevant disciplines, especially in the review of specific diseases.

Epidemiology 213d. Epidemiology of Oral Diseases

Seminars. *One two-hour session each week, fourth period.* Dr. Rothman.

Credit 1 unit.

This course is intended for dentists with an interest in dental epidemiology, including surveys and clinical trials. The epidemiology of oral diseases is reviewed, and methodologic problems intrinsic to dental research are discussed. Participants are invited, but not required, to present an original study design for critical review. Topics to be covered include dental caries, periodontal diseases, oral cancer, malocclusion, and indices of oral health.

Microbiology, Tropical Public Health and Epidemiology 214c,d. Case Studies in Epidemiology of Infectious Disease

Seminars and laboratory exercises. *One two-hour session each week, third and fourth periods.* Dr. Mack, Dr. Morrow, Dr. Langmuir and Dr. Nichols.

Credit 2.5 units.

This course is constructed to provide experience in solving epidemiologic

problems in communicable and other acute disease situations. Epidemics of such disease entities as hepatitis, arbovirus infections, and smallpox are studied in seminars with emphasis on a commitment by the participants.

Epidemiology 300a,b,c,d,e. Tutorial Programs

Participation in departmental research in close association with a staff member. Time and credit are to be arranged with the Head of the Department.

Epidemiology 350. Research

In selecting topics for research in doctoral programs, students should consider the fields in which members of the Department are currently working. These include:

Neoplastic disease (Dr. MacMahon, Dr. Cole, Dr. Mack, Dr. Monson)

Congenital malformation (Dr. MacMahon, Dr. Miettinen, Dr. Yen)

Cardiovascular disease (Dr. Segall)

Dental disease (Dr. Rothman)

Statistical methods (Dr. Miettinen, Dr. Venezian)

Department of Health Services Administration

Alonzo S. Yerby, s.b., m.d., m.p.h., Professor of Health Services Administration, Head of the Department, *and* Director of the Interfaculty Program on Health and Medical Care

William J. Curran, s.b., j.d., ll.m., s.m. in hyg., Frances Glessner Lee Professor of Legal Medicine in the Faculty of Medicine and the Faculty of Public Health

Paul M. Densen, a.b., s.d., Professor of Community Health; *Director of The Center for Community Health and Medical Care, Harvard Medical School and Harvard School of Public Health*

*Alfred L. Frechette, m.d., m.p.h., Clinical Professor of Public Health Practice; *Associate Director for Community Programs, Children's Cancer Research Foundation*

John A. M. Karefa-Smart, b.a., s.b., m.d.,c.m., m.p.h., Visiting Professor of International Health

†Sidney S. Lee, s.b., m.d., m.p.h., dr.p.h., Clinical Professor of Hospital and Medical Care Administration; *Associate Dean for Hospital Programs, Harvard Medical School*

Marjorie A. C. Young, s.b., ed.m., m.p.h., dr.p.h., Professor of Health Education

Alfred Yankauer, a.b., m.d., m.p.h., Senior Lecturer on Health Services Administration

Ralph E. Berry, Jr., a.b., a.m., ph.d., Associate Professor of Economics

Basil J. F. Mott, a.b., m.p.a., ph.d., Associate Professor of Health Services Administration

Jeanette J. Simmons, s.b., m.p.h., s.d. in hyg., Associate Professor of Health Education

*Jack Kasten, s.b., m.p.h., j.d., Lecturer on Health Services Administration; *Consultant, Arthur D. Little, Inc., Cambridge*

*Donald A. Kennedy, a.b., ph.d., Lecturer on Health Services Administration

*Joseph A. Yacovone, a.b., d.m.d., m.p.h., Lecturer on Dental Public Health; *Chief, Office of Comprehensive Health Planning, Rhode Island Department of Health*

* Part-time in the School of Public Health.
†Part-time in the School of Public Health, full-time in Harvard University.

DUNCAN NEUHAUSER, A.B., M.H.A., M.B.A., PH.D., Assistant Professor of Health Services Administration

FLORENCE A. WILSON, A.B., M.D., Assistant Professor of Health Services Administration

*JAMES P. BOLAND, S.B., A.M., Lecturer on Health Economics; *Economist, Massachusetts Department of Welfare*

*HELEN P. CLEARY, A.B., M.P.H., S.D. IN HYG., Lecturer on Health Education; *Senior Associate, Center for Community Health and Medical Care*

*RICHARD W. DODDS, S.B., M.D., Visiting Lecturer on Health Services Administration; *Pediatrician, Harvard Community Health Plan*

*MARVIN DURELL, A.B., S.M., Visiting Lecturer on Health Services Administration; *Associate Director of Clinical Services, Beth Israel Hospital*

*DONALD B. GIDDON, A.B., A.M., D.M.D., PH.D., Lecturer on Dental Health Services; *Professor and Head, Department of Dental Ecology, Harvard School of Dental Medicine*

*R. FRANCES GROMMERS, S.B., M.D., M.P.H., Visiting Lecturer on Health Services Administration

*WILLIAM E. HASSAN, JR., S.B., S.M., PH.D., LL.B., Visiting Lecturer on Hospital Administration; *Director, Peter Bent Brigham Hospital*

*EDWARD B. KOVAR, A.B., A.M., Visiting Lecturer on Community Health Planning; *Director, Health, Hospitals and Medical Care Division, United Community Services*

*ROBERT MORGAN, A.B., M.P.H., Visiting Lecturer on Health Services Administration; *General Director, Dimock Community Health Center*

*ROBERT MORRIS, A.B., S.M., D.S.W., Lecturer on Social Planning; *Professor of Social Planning, The Florence Heller Graduate School for Advanced Studies in Social Welfare, Brandeis University*

*CHARLES NEAVE, A.B., M.D., M.P.H., DR. P.H., Visiting Lecturer on Maternal and Child Health and Health Services Administration; *Chief Physician, Bureau of Standards and Patient Care Review, Massachusetts Department of Public Health*

*BEATRICE F. PHILLIPS, S.B., S.M., Visiting Lecturer on Health Services Administration; *Director, Social Service, Beth Israel Hospital*

*HENRY WECHSLER, A.B., A.M., PH.D., Lecturer on Social Psychology; *Research Director, The Medical Foundation, Inc.*

*DAVID S. WEINER, A.B., M.P.H., Visiting Lecturer on Health Services Administration; *Assistant to the General Director, Children's Hospital Medical Center*

The following members of other Harvard Faculties participate in teaching in the Department of Health Services Administration:

Leona Baumgartner, a.b., a.m., ph.d., m.d., *Visiting Professor of Social Medicine, Harvard Medical School*

James M. Dunning, a.b., d.d.s. m.p.h., *Professor, Department of Dental Ecology, Harvard School of Dental Medicine*

Rashi Fein, a.b., ph.d., *Professor of the Economics of Medicine, Harvard Center for Community Health and Medical Care*

Osler L. Peterson, m.b., m.d., m.p.h., *Professor of Preventive Medicine, Harvard Medical School and Member of the Faculty of the School of Government*

Martin S. Feldstein, a.b., a.m., d.phil.oxon., *Professor of Economics, Faculty of Arts and Sciences*

Leonard W. Cronkhite, Jr., a.b., m.d., *Lecturer on Preventive Medicine, Harvard Medical School; General Director, Children's Hospital Medical Center*

Our contemporary health systems are in a dynamic state of change. Increasingly, health is considered to be a basic human right. Government is more and more being thrust into the health field, for the benefit of both the individual and the community. The increasing complexity of medical technology calls for diverse types of health organizations. This vast growth of organized health services has created an increased need for qualified administrators and researchers.

With the projection of the hospital into community health services and the health department into personal care services, a specialized field of health services administration is emerging. Leadership and research are required to ensure high quality service to both the individual and the community. Health professionals must do more than just provide service, they must be concerned with policy formation, administration, and research. One of the main goals of the Department of Health Services Administration is to provide this education for leadership in health service organizations. Emphasis is placed on planning, organization, delivery, and evaluation of health services. Efforts are made to adapt to the practical problems of providing health services, relevant theory and concepts from the social and behavioral sciences, including such fields as economics, law, political science, anthropology, sociology, and public and business administration. The Department is concerned with research designed to improve the methodology of measuring the effectiveness of health services and in the development and testing of models of health systems and sub-systems.

Emphasis is placed on macro-administration or the administration of health systems. Cross-national studies of health care systems are used as analytic tools to assist the student in gaining an appreciation of the universal nature of the determinants that govern organized activity for the delivery of health services.

Consideration is given to traditional administrative techniques as well as

more recently developed quantitative and analytic methods. Since there are many problems, broad in scope, which must be studied, the resources of multiple disciplines and several Harvard faculties are carefully integrated into the program.

The program leads to the degree of Master of Science or Master of Public Health in the field of Health Services Administration. Candidates for this degree program will be expected to demonstrate competence in their own professional discipline and an understanding of quantitative methods and their application to the planning, administration and evaluation of health services. A minimum of four courses offered or approved by the Department will satisfy the requirements of this program. The remainder of the credits required for the degree may be taken as additional formal courses, tutorials or supervised research in areas of special interest to the candidate.

Qualified students interested in research training may seek admission to either of the doctoral programs offered by the School. During the first year of provisional doctoral candidacy, students are expected to enroll in advanced courses in health services administration and related fields. However, most of the training period beyond the master's degree is occupied by the completion of a research project and the preparation of a thesis. Doctoral candidates must plan at least two years in residence beyond completion of the master's degree.

A three-year residency in the Department of Health Services Administration has been approved as satisfying requirements of the American Board of Preventive Medicine for certification in General Preventive Medicine. Requirements of the approved residency and of the School's degree programs may be satisfied simultaneously.

Special purpose traineeships for master's degree candidates and research training fellowships for doctoral candidates are provided in the Department by the National Center for Health Services Research and the National Institutes of Health.

Since health services administration is fundamentally concerned with health manpower and its effective use in organizations and institutions, the Department maintains close liaison relationships with Harvard Medical School and with several Harvard University-affiliated hospitals. Thus, to the Harvard School of Public Health's expertise in community health, preventive medicine, and research are added the resources of medical education, university hospitals, and the discipline of hospital administration. The Department of Health Services Administration works in close cooperation with the Harvard Center for Community Health and Medical Care. Since the teaching of health services administration also involves training in business administration, economics and government, liaison relationships have been developed between the School and the Harvard School of Business Administration, the Department of Economics, and the John F. Kennedy School of Government

of Harvard University. An important element of community health services training is provided by the mutually beneficial relationships with the Massachusetts Department of Public Health, the Boston City Department of Health and Hospitals, the Cambridge City Department of Health and Hospitals, and the Tri-State Regional Medical Program, the New York City Department of Health, and the Department of Health of the Commonwealth of Puerto Rico.

Health Services Administration 201a,b. The Nature and Function of Health Care Delivery Systems

Lectures and discussions. *Two two-hour sessions each week, first and second period.* Dr. YERBY and Staff of the Department.

Credit 4 units.

This course consists of an analysis of health care systems and their component institutional forms as they have evolved as expressions of the felt needs of societies. There will be an examination and comparison of present-day health service arrangements in three nations (the Soviet Union, the United Kingdom, and the United States), as they reflect national goals and priorities and other constraints. This is followed by an analysis of the major determinants of health care systems including: consumer expectation and demand; health manpower; financing; technology; law; politics; and organization.

The underlying theme is health care systems, their evolution, their structure, how they are currently expressed in selected nations, and the universality of the forces that serve to shape and mold them.

Health Services Administration 202b,c,d. Departmental Seminar

Seminars. *One two-hour session each week, second, third and fourth periods.* Dr. YERBY and Staff of the Department.

Credit 3 units.

This course is for persons concentrating in the Department. It will be focused on current issues in health services administration.

Health Services Administration 203a,b. Administration and Organization of Health Services

Lectures and discussions. *Two two-hour sessions each week, first and second periods.* Dr. MOTT and Dr. NEUHAUSER.

Credit 4 units.

Analysis of the character and functions of the administrative process in health agencies and facilities. The course will focus upon: organizational and environmental factors that shape and constrain the administrative process; decision-making and planning; techniques of administrative control (program planning, budgeting, personnel management, systems analysis, cost benefit and cost effectiveness analysis, etc.); problems of administrative control (conflicts between staff and line, organizational design, reorganization, cen-

tralization versus decentralization, etc.); and differences in administration among health organizations. Students will participate in a group field exercise in which they will prepare for an agency a program plan that takes account of actual community and organizational realities. Generally, following the lectures, the class will be divided into two discussion groups to be led by Drs. Mott and Neuhauser.

Health Services Administration and Maternal and Child Health 204a, 204b. Welfare Programs and Their Relation to Health

Seminars. *One two-hour session each week, first and second periods.* Dr. YERBY, Dr. SCHMIDT and Staffs of the two Departments.

Credit 1 unit in each period.

Welfare and health services have a complementary relationship. More often than not, however, this relationship, which should serve to protect and promote health and well-being, fails to work well. Policy and practice seldom result in desired assurance of all needed services in a timely and harmonious manner. The purpose of this course is to raise questions of public policy in relation to health and welfare. During the first period the U.S. system of income maintenance will be contrasted with the systems of other countries and evaluated with respect to its effectiveness and the attitudes underlying its provisions. Alternative approaches will be studied. In the second period the focus will be on child welfare services. These too will be studied with respect to their effectiveness in meeting the needs of children and their families and as they relate to health care.

Either period may be taken separately.

Health Services Administration 205a,b. Health Education

Seminars. *One two-hour session each week, first and second periods.* Dr. YOUNG, Dr. SIMMONS and Dr. CLEARY.

Credit 2 units.

This course emphasizes major aspects of learning theory, communication theory, educational methods, and health behavior; health education in the process of social change; psychosocial and cultural factors relevant to the planning of health education programs; and research and evaluation in health education. The major focus of the course is on health education aspects of community health programs, including school health services.

The above course will be repeated in c,d period if a sufficient number of students are enrolled.

Health Services Administration 206c,d. Health Law, Public Policy, and Consumer Protection in the Health Field

Seminars. *One two-hour session each week, third and fourth periods.* Dr. CURRAN

Credit 2 units.

This course is designed for students interested in the application of law and legislative process to the establishment of public policy in the health field in such areas as medical care delivery systems, health manpower, and health care organizations. It will examine regulatory programs in health areas, such as the Federal Trade Commission and the Food and Drug Administration, the use of legal actions to protect the consumers, and will measure for facilitating consumer involvement in decision-making in the health field.

The rights and legal protection of health providers, the health industry, and the food and drug industries will also be considered, particularly as related to matters of due process of law, hearings, and opportunity to present views fairly and effectively in the legislative and regulatory processes.

Students may also take advance work in selected areas of the above fields under the direction of Dr. Curran and his associates.

Health Services Administration 207a,b. Dental Public Health Practice

Seminars and field visits. *One two-hour session each week, first and second periods.* Dr. YACOVONE.

Credit 2 units.

This seminar course is designed for dentists and for those of other disciplines who desire training in depth in the administration and planning of dental health programs. All phases of dental public health are covered including dental needs, resources, surveying, dental health education, fluoridation, prepayment, and evaluation of programs. Reading assignments are used to stimulate class discussion. Each student develops a program plan in a specific area of community dental need and presents the plan to the class. Participants make field trips to several dental facilities. Students may elect to do advanced work in any phase of dental public health.

Health Services Administration 208c,d. The Economics of Health Services and Health Planning

Lectures and discussion. *Two one and one-half hour sessions each week, third and fourth periods.* Dr. BERRY.

Credit 4 units.

This course is designed to provide an examination of the economic aspects of the production, distribution, and organization of health services. The course is devoted to applying the framework of economic analysis to the health services sector. During the first part of the course, consideration will be given to the economic organization of medical care. The supply and demand of medical care facilities, the markets for physicians' services and other health manpower, and the financing of medical care will be analyzed. During the second part of the course, planning will be viewed as an

alternative to the market as a mechanism for allocating scarce resources. The role of government, cost-benefit analysis, problems of health planning, and approaches to the integration of health planning and economic planning will be discussed.

Prerequisite: ID 210a,b or its equivalent is sufficient to prepare the student for this course.

Health Services Administration 211c,d. Administration of Personal Health Service Programs

Seminars and field projects. *One two-hour session each week, third and fourth periods.* Dr. KASTEN and Dr. WILSON.

Credit 2 units.

The course is designed for students who will be administrators of personal health service programs. Inpatient (general hospital, specialty hospital, and long-term care facility), ambulatory (private physician, group, hospital outpatient and emergency), home, multiple screening and rehabilitation programs are treated from an operational and preventive perspective. Special emphasis is placed on services for the chronically ill and/or aged and administrative problem solving. Students analyze administrative problems in operating personal care service programs.

Health Services Administration 212c,d. Policy and Practices in Medical Care Organization

Seminars. *One two-hour session each week, third and fourth periods.* Dr. LEE, Dr. FEIN, and Dr. YERBY.

Will not be given in 1972–73.

Credit 2 units.

This is an interdisciplinary course emphasizing analysis, planning, and decision-making in specific programs in medical care. The subjects covered include both governmental and voluntary programs; cost, utilization, structure and quality of services; and organizational and manpower problems in medical care programs. Case materials and selected readings are used.

Health Services Administration 213c,d. Politics and Organization of Health Planning

Seminars. *One two-hour session each week, third and fourth periods.* Dr. MOTT.

Credit 2 units.

This course will describe and analyze the operating characteristics of the principal types of health planning agencies, such as comprehensive health planning agencies, and their capacity as organizational vehicles to attain desired objectives. The underlying objective is to consider how the effectiveness of planning agencies and planning personnel can be maximized. The course will focus upon the following topics: theories of community planning, com-

munity decision-making processes; the impact of community variables upon the operation of planning agencies; the effect upon the performance of planning agencies of their organizational characteristics; conditions and strategies for effective planning; and the prospects of health planning agencies.

Health Services Administration 214c,d. Methods for the Efficient Management of Health Services Organizations

Seminars. *One two-hour session each week, third and fourth periods.* Dr. NEUHAUSER.

Credit 3 units.

In the "c" period, this course will describe management techniques related to improving efficiency in health services organizations, including information and control systems, leadership, matrix organization, budgeting, decision-making techniques, and personnel practices.

In the "d" period, the emphasis will be on measurement of performance, including cost and quality of care and on those organizational characteristics which influence efficiency such as size, scope of services, occupancy, average length of stay, staffing ratios, goals and environment. Applications to hospitals, ambulatory facilities and clinical medicine will be made.

This course is designed to develop basic management techniques, show how they can be used to modify organizational characteristics which in turn relate to efficiency.

It would be helpful, but not essential, that the student have some prior preparation in administration and organization theory which may be obtained in HSA 203a,b. A term paper will be required for which individual assistance will be provided.

Health Services Administration 215c. Administration of Ambulatory Care Programs

Seminars. *One two-hour session each week, third period.* Dr. WILSON.

Credit 1 unit.

This course deals with the concepts, problems and issues involved in administering ambulatory care programs. These will include organization, operations, professional and non-professional staffing, and the concept of the health care team. Comparative models such as neighborhood health centers and group practice will be discussed.

Prerequisite: Health Services Administration 201a,b, 203a,b or permission of the Instructor.

Health Services Administration 215d. Administration of Ambulatory Care Programs

Seminars and Tutorials. *One two-hour session each week, fourth period.* Dr. WILSON.

Credit 1 unit.

Continuation of Health Services Administration 215c for students with special interests.

Biostatistics and Health Services Administration 216c,d. Health Program Evaluation

Seminars and Tutorials. *One two-hour seminar in first week of third period; weekly tutorial group meetings for remainder of third period; one two-hour seminar each week, fourth period.* Mr. Frazier, Dr. Densen, Dr. Feldman, Mrs. Jones, and Dr. Reed.

Credit 2.5 units.

This course is designed for students interested in the evaluation of ongoing health programs. After an introduction to the literature on evaluation methods, students are assigned to groups, each of which designs an evaluation proposal for a specific health program. During the fourth period seminars, these proposals are presented and critically analyzed by the students.

Health Services Administration 219b, 219c. Delivery of Urban Health Services

Seminars. *One one and one-half hour session per week, second and third periods.* Dr. Neuhauser.

Credit 1 unit in each period.

This seminar will cover problems and solutions, successes and failures in the delivery of urban health services. Topics include outreach clinics, community participation, financing, the role of state and federal government, urban hospitals, drug programs, medical schools, and personnel. Newly developed teaching cases will be used and a different case will be discussed each week. The student is required to read the case, analyze the problem and discuss it in class.

This will be coordinated with Behavioral Science 208c,d, Urban Social Problems. It is expected that part of the requirements for Behavioral Science 208c,d will be participation in HSA 219c.

Either period may be taken separately.

Health Services Administration 295a,b. Economics of Health Care Policy (Economics 2950a)

Seminars. *One two-hour session each week, first and second periods.* Dr. Fein.

Credit 3 units.

This is an advanced interdisciplinary course for doctoral candidates at the schools and departments associated in the Interfaculty Program — the Schools of Public Health, Medicine, the Kennedy School of Government, Business Administration, and the Department of Economics — and for students with advanced standing at the School of Public Health.

The course provides a survey of the basic economic issues of American health care policy. Seminar faculty and guest lecturers will present material on relevant topics including: The role of the market and government planning; health manpower; government insurance and financing programs; rising costs; the provision of urban medical services. I.D. 210a,b or its equivalent will normally be sufficient to prepare students for this course.

Each student is expected to prepare a term paper.

Health Services Administration 295c,d. Economic and Administrative Issues in Medical Care (Economics 2950b)

Seminars. *One two-hour session each week, third and fourth periods.* Dr. Berry, and Dr. Peterson.

Credit 4 units.

This seminar is concerned with the major issues of the medical care sector. The course starts with a discussion of the relevant goals, objectives, and constraints of the health system of the United States. Specific attention is given to issues of access to services, quality of care, and costs and inflation in the health sector. Alternative health care systems and planning are also considered. During the second half of the course student groups present their analysis of a specific significant issue in health or medical care. Throughout the course there is an emphasis on health policies and policy making.

Health Services Administration 300a,b,c,d,e. Tutorial Programs.

Time and credit to be arranged.

Master's degree candidates may make arrangements to do individual and group work under the guidance of a staff member of the Department.

This work can include readings and special projects in such areas as dental health, medical care, and health education. In addition, field assignments to federal, state, and local government and private health organizations can be arranged.

301 *Field Work in Health Care Settings*, Dr. Kennedy

A tutorial for students interested in study problems that require direct experience in operational settings. Each student will be expected to develop a study project and a field location will be selected in terms of its relevance to the study problem. Faculty members will be available for introduction to the field setting, for consultation, and for regulation tutorial discussion. The presence and participation of the student should have the potential for assisting the organization to resolve some meaningful problem.

A range of health care settings are available in the Boston area for this supervised fieldwork — hospitals (teaching, municipal, community), nursing homes, community health centers, private practice offices, municipal health

departments, health planning agencies, health insurance organizations, legislative subcommittees concerned with health, state health agencies, medical school planning offices, district medical societies, and environmental health agencies.

The tutorial is available for either one-half or one full academic year. Credit will vary and be related to the time devoted to the project.

302 *Research in Health Education*, Dr. Wechsler, Dr. Young and Dr. Simmons

This tutorial aims to assist doctoral students and others interested in research methodology in health education to understand the elements of research design and to apply these elements in analyzing a number of research projects and in developing original research proposals. Special emphasis is given to evaluation research.

303 *Dentistry and Social Policy*, Dr. Yacovone

This tutorial will be given during the third and fourth periods and is designed for dentists and for those of other disciplines who wish to investigate the relationships between the social sciences and dentistry. Subjects to be considered include The Role of the Social Sciences in Dentistry, Psychosocial Interaction of Doctor and Patient, Client Perceptions of Dentistry, Interpersonal Relationships in Group Practice, and The Sociopolitical Influence on Dentistry as an Organization. Reading assignments are used to stimulate group discussion.

Health Services Administration 304c,d. Decision Analysis (Offered in Fall Term at Kennedy School of Government, Public Policy 211)

A self-paced, self-instructional, multi-media course on decision analysis. The course is broken into 16 modules. Professor Howard Raiffa (Faculty of Public Administration).

Credit 5 units.

The course involves structuring of decision problems in terms of decision trees; use of information to revise probabilistic judgments; economic value of information; decisions concerning accumulation of evidence; attitudes towards risk; art and science of assessing distributions of uncertain quantities; use of panels of experts; analysis of complex problems from business, medicine, law, public policy; simulation and Monte Carlo techniques; structuring of values, goals, and objectives; value tradeoffs; discounting and problems of futurity; risk-sharing; group decisions.

Students will be expected to do several multiple choice tests, to do one or two written analyses of complex cases, and to take a final examination.

Health Services Administration 330e. Assignments to Field Agencies

One-week period between Fall and Spring Terms.

Credit 1 unit.

Students are assigned to work in the field on special projects, on group surveys or other types of field projects, or for observation of, and limited participation in, the work of health agencies.

Field assignments are made on an individual basis to meet the special needs of each student insofar as possible. Work in the field is coordinated with courses in the Department.

A field study of regionalized health services in Puerto Rico may be arranged in cooperation with the University of Puerto Rico School of Public Health. The work of the week is devoted to observation of the organization and function of peripheral, intermediate and central units of the health care systems in the North East Region of the Department of Health of the Commonwealth of Puerto Rico. The program includes a limited number of elective visits to other governmental health programs and to private or voluntary agencies or institutions.

Health Services Administration 350. Research

Doctoral candidates are offered the opportunity of undertaking individual study and research as the basis for a doctoral thesis.

The following courses, which are presented in Harvard Medical School, are open to properly qualified students in the School of Public Health. Consult the 1972–73 Harvard Medical School Schedule of Elective Courses and Core Clinical Clerkships for complete descriptions of these courses.

Preventive and Social Medicine HMS 706.0. Illness and Public Policy

Seminars. *One two-hour session each week, first, second, third and fourth periods.* Wednesdays, 4–6 p.m. Dr. Reiser, Dr. Ebert, Dr. Peterson, and Dr. Fiering.

Preventive and Social Medicine HMS 715.0. Prepaid Health Care in the United States.

Lectures, discussions, and readings. *One two-hour session each week, second and third periods.* Wednesdays, 1:30–3:30 p.m. Mr. Pollack.

History of Medicine HMS 701.0. Social Problems in the History of Medicine

Seminars. *One two-hour session each week, third and fourth periods.* Mondays, 4–6 p.m. Dr. Reiser.

Department of Maternal and Child Health

William M. Schmidt, s.b., m.d., a.m. (hon.), Professor of Maternal and Child Health *and* Head of the Department

Isabelle Valadian, m.d., m.p.h., Associate Professor of Maternal and Child Health

Johanna T. Dwyer, s.d., s.m., s.m. in hyg., s.d. in hyg., Assistant Professor of Nutrition and Maternal and Child Health

Helen D. Cohn, m.p.h., Lecturer on Public Health Nursing

*Samuel Weith Dooley, s.b., m.d., Visiting Lecturer on Maternal and Child Health; *Medical Director, Department of Youth Services, Commonwealth of Massachusetts*

*James E. Drorbaugh, a.b., m.d., m.p.h., Visiting Lecturer on Child Health; *Associate Director, China Medical Board, New York City*

Barbara Kohlsaat, a.b., a.m., a.m., Lecturer on Social Welfare

*Arthur J. Lesser, a.b., m.d., m.p.h., Visiting Lecturer on Maternal and Child Health; *Director, Maternal and Child Health Service, Health Services and Mental Health Administration, U.S. Department of Health, Education and Welfare*

*E. James Lieberman, a.b., m.d., m.p.h., Visiting Lecturer on Maternal and Child Health; *Assistant Clinical Professor of Psychiatry, Howard University*

*Antonio S. Medina, m.d., m.p.h., Visiting Lecturer on Maternal and Child Health; *Associate Professor and Director, Department of Human Development, University of Puerto Rico School of Public Health*

*Rowland L. Mindlin, s.b., m.d., m.p.h., Lecturer on Maternal and Child Health; *Director of Maternal and Child Health, Boston Department of Health and Hospitals*

*Robert Morris, a.b., s.m., d.s.w., Lecturer on Social Planning; *Professor of Social Planning, The Florence Heller Graduate School for Advanced Studies in Social Welfare, Brandeis University*

*Charles Neave, a.b., m.d., m.p.h., dr. p.h., Visiting Lecturer on Maternal and Child Health and Health Services Administration; *Chief Physician, Bureau of Standards and Patient Care Review, Massachusetts Department of Public Health*

* Part-time in the School of Public Health.

*Leon Sternfeld, s.b., m.d., ph.d., m.p.h., Visiting Lecturer on Maternal and Child Health; *Medical Director and Director of Research, United Cerebral Palsy Associations, New York City*

*James E. Teele, a.b., a.m., ph.d., Lecturer on Sociology; *Professor of Sociology, Department of Sociology and Anthropology, Boston University*

*Ruth M. Butler, a.b., s.m., Research Associate in Social Work

The following individuals who hold appointments in Harvard Medical and Dental Schools participate in teaching in the Department of Maternal and Child Health

Charles A. Janeway, a.b., m.d., a.m. (hon.), *Thomas Morgan Rotch Professor of Pediatrics*

William Berenberg, a.b., m.d., *Clinical Professor of Pediatrics*

Thomas E. Cone, Jr., m.d., *Clinical Professor of Pediatrics*

Coenraad F. A. Moorrees, d.d.s., a.m. (hon.), *Professor of Orthodontics at the Forsyth Dental Infirmary for Children, Research Associate in Odontology*

John P. Connelly, s.b., m.d., *Associate Professor of Pediatrics at Massachusetts General Hospital; Executive Director, Bunker Hill Center of the Massachusetts General Hospital*

Howard N. Jacobson, m.d., *Associate Professor, Obstetrics and Gynecology at Boston Hospital for Women*

Robert B. Berg, a.b., m.d., *Assistant Professor of Pediatrics at Beth Israel Hospital*

Robert G. Rosenberg, m.d., *Instructor in Pediatrics at Children's Hospital; Director, Martha M. Eliot Health Center*

The Department of Maternal and Child Health is concerned with education and research in health services for mothers and children a.) as a part of general health services and b.) as they relate to other service systems (especially social services and education). The planning for the delivery of personal health, social, and family planning services to mothers and children depends upon knowledge of:

1. the aspirational values which society places upon them, their special vulnerability to biological and environmental hazards, and the successive phases of biological change (growth and development);

2. the social situation and the way in which social services function as they affect the health of children and influence the child-care capability of families;

3. the health aspects of centers of early childhood education, and traditional and innovative practices in elementary and high schools.

The courses and tutorial work offered by the Department are focused on actions which these characteristics demand for planning, administration, and evaluation of health care services. Maternal and Child Health services, including services for handicapped children, at international, national, and local levels, are discussed in terms of integration with related health services in the community. In connection with this Departmental focus, the important roles of national governments, local health agencies, voluntary organizations, and community consumer groups are considered in seminars, observations of service programs in operation, or study of reports of such programs, foreign as well as domestic.

Fellowships are available for students who are concentrating in Maternal and Child Health.

Maternal and Child Health 202b. Comprehensive Maternal and Child Health Care

Seminars and field visits. *One two-hour session each week, second period.* Dr. VALADIAN and Staff of the Department.

Credit 1 unit.

Four field observations and four seminars. The field visits are to centers providing comprehensive care in the Metropolitan Boston area. The visits are followed by classroom sessions to discuss observed activities and relate them to Maternal and Child Health and Crippled Children's programs. Faculty members participate in all field visits.

Maternal and Child Health 203c,d. Programs in Maternal and Child Health

Seminars. *Two two-hour sessions each week, third and fourth periods.* Dr. SCHMIDT, Dr. VALADIAN, and Staff of the Department.

Credit 4 units.

The focus is on the health needs of families with children as these needs change with the age periods of childhood. Beginning with a block directed to planning for children, the successive segments of the course include maternity, early childhood, later childhood, and adolescence and youth. Seminars to discuss programs, legislative developments and research; faculty-accompanied field visits; and student presentations based upon assigned readings are used. These sessions trace health and social needs of mothers and children, and special issues in the organization of appropriate services for them.

Health Services Administration and Maternal and Child Health 204a, 204b. Welfare Programs and Their Relation to Health.

Seminars. *One two-hour session each week, first and second periods.* Dr. YERBY, Dr. SCHMIDT and Staffs of the two Departments.

Credit 1 unit in each period.

Welfare and health services have a complementary relationship. More often than not, however, this relationship, which should serve to protect and promote health and well-being, fails to work well. Policy and practice seldom result in desired assurance of all needed services in a timely and harmonious manner. The purpose of this course is to raise questions of public policy in relation to health and welfare. During the first period the U.S. system of income maintenance will be contrasted with the systems of other countries and evaluated with respect to its effectiveness and the attitudes underlying its provisions. Alternative approaches will be studied. In the second period the focus will be on child welfare services. These too will be studied with respect to their effectiveness in meeting the needs of children and their families and as they relate to health care.

Either period may be taken separately.

Maternal and Child Health 205d. Research Approach to Growth, Development and Health of the Child

Seminars. *Two two-hour sessions each week, fourth period.* Dr. VALADIAN and Dr. REED.

Credit 2 units.

Methods of obtaining and evaluating data on child growth, development, and health, and the construction of norms. Problems involved in the study of interrelationships between various aspects of the child's progress and between the child and his background and environment.

Illustrative material from the Longitudinal Study of Child Health and Development conducted in this Department since 1930 by Dr. Harold C. Stuart, Professor *Emeritus*, as well as data from other studies in this country and abroad.

Enrollment is subject to the approval of the Instructor.

Maternal and Child Health 206c. Adolescence and Youth: Sociological Concepts Related to Health Care

Lectures and seminars. *One two-hour session each week, third period.* Dr. TEELE and Staff of the Department.

Credit 1 unit.

A multi-disciplined approach to adolescent and youth behavior in the United States with material on sociopsychological theories and research in the field. Review of social science research on socialization practices, adoles-

cent culture, and adolescent problems, including health problems. The aim of the course is to introduce the student to the apparent social and health consequences for youth of earlier familial influences with respect to health care, health attitudes, and child-rearing practices. The relationship of the structure of society to the growth and development of children and youth is considered.

Maternal and Child Health and Nutrition 207a,b. Nutrition in Child Growth and Development

Lectures and discussions. *One two-hour session each week, first and second periods.* Dr. DWYER and Visiting Lecturers.

Credit 2.5 units.

Principles and practical problems encountered in maternal and child nutrition are presented in this course. Its design is to help students make judgments based on the relevant scientific evidence on such questions as: optimum weight gain during pregnancy and situations calling for dietary modifications in pregnancy; effects of malnutrition on physical and mental growth and development; interrelationships between nutrition and infectious disease during early life; indications for and against breast feeding; factors governing the formulation of infant diets; the treatment of feeding disorders and of children and adolescents with special nutrition problems; and programs or services available for getting food, money for food, or help to those at risk of poverty-induced malnutrition.

Students will gain practical experience in the interpretation of food balance sheets, tables of food composition, and nutrition survey data; in the determination of which evaluation techniques should be applied to specific nutrition problems; and in critical review of the nutrition literature.

Lectures will concentrate on general principles; discussions will deal with a variety of practically oriented case studies and simulations illustrative of problems in both developing and highly industrialized nations concerning nutrition. A report related to the student's interests entailing roughly fifteen hours of student time will be required.

Maternal and Child Health 300b,c,d,e. Tutorial Programs

Time to be arranged.

Credit 2 or more units.

Two types of tutorial programs are offered. One consists of work in an individual project under guidance; work is often based upon observation of health programs, study of health or vital records. A second type is based primarily upon directed reading and scheduled discussion with the appropriate faculty member; examples are: planning and evaluating health care services to mothers and children, public health care nursing in family and community health programs, technical assistance to developing countries

in maternal and child health; the history, evolution, and future of school health. Similar tutorial programs are available in the developmental or social aspects of child health. Advance approval by the Head of the Department is required.

Maternal and Child Health 330. Field Studies

1. *One-week period between Fall and Spring terms.*

Credit 1 unit.

A field study in Puerto Rico is arranged in cooperation with the Department of Human Development of the University of Puerto Rico, School of Public Health. The full week is devoted mainly to observation of Maternal and Child Health activities, including programs for handicapped children and family planning services. Small groups travel to four different regions.

Consent of the Head of the Department is required for admission to this course. *Enrollment must be made by the end of the first period.* (See page 204 for an estimate of the cost.) Preference is given to students whose special field of interest is Maternal and Child Health. Other students may enroll, to the limit of capacity.

2. Other field experiences may also be arranged for credit during the same week and at other periods of the year as time permits.

3. Students whose special field of interest is Maternal and Child Health and who do not have sufficient previous experience will be encouraged to have a period of field study before registration. Field study may also be undertaken after the completion of the academic year in a program arranged by the Staff of the Department. No credit.

Maternal and Child Health 350. Research

Doctoral degree students may undertake research in Maternal and Child Health by arrangement with the Head of the Department.

Department of Microbiology

Roger L. Nichols, A.B., M.D., A.M. (hon.), Irene Heinz Given Professor of Microbiology, Head of the Department, *and* Associate Director of the Center for the Prevention of Infectious Diseases

Charlotte C. Campbell, S.B., S.D. (hon.), Professor of Medical Mycology

Edward S. Murray, A.B., M.D., M.P.H., Professor of Microbiology

John C. Snyder, A.B., M.D., LL.D., Professor of Population and Public Health *and* Medical Director of the Center for Population Studies

J. William Vinson, S.B., S.D. in HYG., Associate Professor of Microbiology

Jan Cerny, M.D., PH.D., Assistant Professor of Microbiology

Myron E. Essex, S.B., D.V.M., S.M., PH.D., Assistant Professor of Microbiology; *Special Fellow of the Leukemia Society of America, Inc.*

*Charles E. O. Fraser, B.V.SC., M.R.C.V.S., D.T.V.M., S.M., PH.D., Assistant Professor of Microbiology; *Microbiologist, New England Regional Primate Research Center*

A. Bruce MacDonald, A.B., PH.D., Assistant Professor of Microbiology

J. Dennis Mull, A.B., M.D., M.P.H., Assistant Professor of Microbiology

*Nicholas J. Fiumara, A.B., M.D., M.P.H., Visiting Lecturer on Infectious Diseases; *Director, Division of Communicable and Venereal Diseases, Massachusetts Department of Public Health*

*George F. Grady, S.B., M.D., Lecturer on Applied Microbiology; *Director, Division of Biologic Laboratories, State Laboratory Institute, Massachusetts Department of Public Health*

*Martha D. Berliner, A.B., A.M., PH.D., Senior Research Associate in Microbiology; *Associate Professor of Biology, Simmons College*

Helen R. Buckley, S.B., PH.D., Research Associate in Medical Mycology

*Kenneth F. Girard, S.B., M.SC., PH.D., Research Associate in Microbiology; *Assistant Director, Division of Diagnostic Laboratories, State Laboratory Institute, Massachusetts Department of Public Health*

*Farrokh Z. Modabber, A.B., PH.D., Research Associate in Microbiology

Stephen A. Morse, A.B., S.M.P.H., PH.D., Research Associate in Microbiology

*Eleanor G. Shore, A.B., M.D., M.P.H., Research Associate in Microbiology; *Assistant Physician, University Health Services; Assistant to the President, Harvard University*

* Part-time in the School of Public Health.

*Robert E. Oertley, A.B., M.D., Field Project Administrator; *Assistant Chief, Ambulatory Health Services, Arabian American Oil Company*

Morris D. Cooper, A.B., S.M., PH.D., Research Fellow in Microbiology

Thomas J. Fitzgerald, A.B., S.M., PH.D., Research Fellow in Microbiology

Neil S. Orenstein, A.B., A.M., PH.D., Research Fellow in Microbiology

Sumner E. Thompson, III, A.B., M.D., M.P.H., Research Fellow in Microbiology

Ronald R. Watson, S.B., PH.D., Research Fellow in Immunology

*Leo Levine, S.B., Assistant in Microbiology; *Chief of Laboratory, Division of Biologic Laboratories, State Laboratory Institute, Massachusetts Department of Public Health*

Dorothy E. McComb, S.B., Assistant in Microbiology

*Teresa R. Rota, A.M., Assistant in Microbiology

*Judith M. Spielman, S.B., S.M. IN HYG., Assistant in Microbiology

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Alexander G. Langmuir, A.B., M.D., M.P.H., *Visiting Professor of Epidemiology, Harvard Medical School*

Louis Weinstein, S.B., S.M., PH.D., M.D., *Lecturer on Infectious Diseases, Harvard Medical School; Professor of Medicine, Tufts University School of Medicine*

Ruth B. Kundsin, A.B., A.M., S.D. IN HYG., *Research Associate in Bacteriology, Department of Surgery, Harvard Medical School; Associate Staff Member, Peter Bent Brigham Hospital*

Infectious diseases remain a major health problem, costing the United States billions of dollars each year; in underdeveloped countries these diseases impede progress. Microbiologists must now be concerned not only with prevention and treatment but with policy formation, administration and research if the problems of infectious disease, domestic and foreign, are to be solved. One of the goals of the Department of Microbiology, in conjunction with the Department of Tropical Public Health in the Center for Prevention of Infectious Diseases, is to provide this education for leadership in control of infectious diseases. Emphasis is placed on the decision making processes involved in diagnostic and surveillance programs; in judging the uses and limitations of public health systems, domestic and foreign, in the control of infectious disease; and in study of fundamental microbiological and immunological problems in infectious diseases of public health significance. The multifactorial causation of infectious diseases is emphasized in teaching and is related to the changing political, social and economic patterns in developed and underdeveloped countries which impinge upon the dynamics of the microbe-host relationship.

A major objective of the Department is to train students to think of

infectious diseases in the context of epidemiology. Advances in immunology have extended the scope of inquiry required of microbiologists to autoimmune disorders, hypersensitivity phenomena, variations in host responses, cancer and immunological surveillance mechanisms.

Candidates for the degree of Master of Public Health or Master of Science in Microbiology must demonstrate competence in microbiology and immunology; they must understand the problems and opportunities in the control of infectious disease in developed as well as underdeveloped countries. A minimum of four courses offered or approved by the Department will satisfy this requirement. The remainder of the credits required for the degree may be taken as additional formal courses, tutorials, or supervised research in areas of special interest to the candidate.

Qualified students interested in research training may be admitted to either the Doctor of Public Health or the Doctor of Science programs offered by the School in the Department of Microbiology. During the first year of a provisional doctoral candidacy, students are expected to enroll in advanced courses in microbiology, immunology and related fields in the School of Public Health, in the Harvard Medical School or in other areas of Harvard University or the Massachusetts Institute of Technology. Doctoral candidates must plan at least one year in residence beyond completion of the Master's degree. Most of the training beyond the Master's degree is occupied by completion of a research project and preparation of a thesis. Applied aspects of research are emphasized.

The Department maintains close liaison with Harvard Medical School and with several hospitals affiliated with Harvard University. Thus to the School of Public Health's interest and expertise in preventive and surveillance programs, community-wide or global in scope, are added the resources of medical education and university hospitals which emphasize the fundamental aspects of microbiology, immunology and the individual care of the patient.

Microbiology and Tropical Public Health 201a,b. Ecology and Epidemiology of Infectious Diseases

Lectures, seminars, and laboratory exercises. *Three one-hour sessions and one three-hour session each week, first period; one one-hour and two two-hour sessions each week, second period.* Dr. Weller, Dr. Nichols, and Staffs of the two Departments.

Credit 4 units.

This course is designed to provide an integrated presentation of information on communicable diseases of major public health importance. The exercises include discussions of the present status of infectious diseases in the developed and the developing areas of the world, and of procedures for their control from the community to the international level.

The course assumes a medical school background and an understanding of the pathogenesis of disease produced by bacteria, fungi, helminths, protozoa, rickettsiae, spirochetes and viruses. It is concerned primarily with ecologic and other factors affecting transmission of these agents, with assessment of the public health significance of representative infectious diseases and with the increasing importance of the selection of methods for their prevention and control, particularly as regards the use of vaccines, chemotherapeutic agents, insecticides and other biologicals. In the laboratory exercises and demonstrations, the student is not expected to acquire technological skills, but rather an understanding of the potentialities and limitations of pertinent laboratory and field procedures.

Microbiology and Tropical Public Health 202b. Current Research in Infectious Diseases

Seminars. *One two-hour session each week, second period.* Dr. CHERNIN, Dr. VINSON, and Staffs of the Departments of Microbiology and Tropical Public Health.

Credit 1 unit.

This course is required of all students concentrating in Microbiology or Tropical Public Health. Papers on topics of general interest are selected from current periodicals and critically reviewed as to soundness of experimental design, validity and significance of results and conclusions, organization of manuscripts and clarity of presentation.

Enrollment of nondepartmental students subject to approval of Instructor.

Microbiology 203d. Clinical Problems in Infectious Diseases

Lectures and clinics. Given at the New England Center Hospital. *One two-hour session each week, fourth period.* Dr. WEINSTEIN.

Credit 1 unit.

Problem cases concerning diagnosis, treatment and control of the common acute communicable diseases of temperate climates are presented, together with discussions of infectious diseases that are usually not considered communicable.

Microbiology 204c. Public Health and Laboratory Aspects of Infectious Diseases of Microbial Origin

Seminars and laboratory exercises. *Two three-hour sessions and one one-hour session each week, third period.* Dr. MURRAY and Staff of the Department.

Credit 2.5 units.

This course is for the epidemiologist as well as the microbiologist and is designed to complement Microbiology-Tropical Public Health 201a,b. Lab-

oratory procedures used in the diagnoses of diseases of viral, bacterial, chlamydial and mycotic origin are studied.

Students do the laboratory procedures. Viruses and rickettsiae are isolated in cell cultures or in fertile eggs. Guinea pigs and mice are inoculated to study the characteristics of various viruses and chlamydia. Special media are used to identify the mycoses and mycoplasmatales. Students will perform in detail principal serologic and immunochemical technics such as complement fixation, neutralization, agglutination, immunofluorescence, chromatography, gel diffusion, immunoelectrophoresis and conjugation.

Seminar discussions center around the potentialities and limitations of the laboratory technics employed in both laboratory and field studies.

Enrollment is limited and subject to the approval of the Instructor.

Microbiology, Tropical Public Health, and Epidemiology, 206d. Tuberculosis

Seminars. *One two-hour session each week, fourth period.* Dr. Morrow, Dr. Mack, Dr. Berggren and Dr. Campbell.

Credit 1 unit.

The purpose of this course is to provide an understanding of the ecology and the public health significance of tuberculosis. Emphasis is on tuberculosis control in the less-developed countries. Seminars focus on the microbiological, epidemiological, cultural, and economic factors which influence the form and effectiveness of tuberculosis control. Consideration is given to methods of analyzing the costs and benefits of national tuberculosis control programs.

Microbiology 207a. Fundamentals of Immunology

Lectures. *Three one-hour sessions each week, first period.* Dr. MacDonald and Staff of the Department.

Credit 2.5 units.

This course explores the fundamental principles of immunology and host defense mechanisms. Many aspects of immunology will be studied including humoral and cellular phenomena.

The course is intended to allow those individuals with no previous exposure to the field to become acquainted with essential principles; it will serve as a review for those wishing to expand their knowledge of immunology or reappraise their attitudes in a burgeoning field.

Lectures will include discussions on antigen-antibody reactions, immunochemistry, complement, antibody biosynthesis, cellular immunity, cell interaction and mediators of cellular response.

The course will be open to all students interested in immunology; familiarity with this discipline is not required.

Microbiology 208b. Immunology of Infectious Dieases

Lectures and laboratory exercises. *Two one-hour sessions each week, second*

period. Laboratory exercises to be arranged. Dr. MacDonald and Staff of the Department.

Credit 2.5 units.

The course will apply the fundamentals of immunology learned in Microbiology 207a to diseases of importance to public health. A number of diseases will be selected for discussion from an immunological point of view. Host defense mechanisms to these diseases will be studied. Examples include: immunology of mucosal surface infections such as gonorrhea, trachoma or cholera; pathogenesis of antigen-antibody complexes in streptococcal infections; immunology of malaria, cancer and tuberculosis; problems associated with mycotic infections, and host defense mechanisms to smallpox and measles.

The course is intended for students who wish a rigorous study of immunology.

Prerequisite: 207a or equivalent.

Microbiology 209b. Laboratory in Immunology

Laboratory. *Two three-hour sessions per week, second period.* Dr. MacDonald and Staff of the Department.

Credit 2.5 units.

The laboratory will consist primarily of recently developed techniques which can be utilized in the study of infectious diseases. These techniques will include isolation and modification of antigens, radio-immunoassay, immunoplaque assay, isolation of antibodies, fluorescence labelling, immunoabsorption, phagocytosis, migration inhibition factor, blast transformation, virus neutralization and complement fixation.

The course is intended for students who wish to become familiar with recent techniques in immunology.

Prerequisite: 207a or equivalent.

Enrollment limited; prior approval of Instructor is required.

Microbiology 211b. Medical Mycology

Laboratory, conferences and field exercises. *One three-hour session and three hours of individual laboratory work each week, second period.* Dr. Campbell.

Credit 2 units.

This course introduces physicians and microbiologists to laboratory and field research and clinical studies in medical mycology. No prior knowledge of the mycoses is assumed. The course surveys pathogenic fungi and mycoses of medical and public health importance. It consists of conferences, workshops, laboratory and field studies under tutorial supervision. Procedures for isolating and identifying mycotic pathogens from a variety of clinical specimens and sources in nature are carried out in their entirety,

including adjunctive technics. The role and interpretation of skin and serologic tests are considered in detail as they relate to individual cases and in the definition of geographic areas of high endemicity of the various respiratory mycoses.

In patients debilitated by severe disease or in surgical patients following organ transplantation, there has been a startling increase of devastating infections caused by otherwise innocuous yeasts and fungi; this is only one of the mycoimmunologic problems requiring extensive basic and applied research. Ecologic, epidemiologic and differential diagnostic points are illustrated and emphasized by studies of histories of proved individual cases or outbreaks of mycotic disease.

Enrollment is subject to the approval of the Instructor.

Microbiology 213d. Intracellular Microorganisms Pathogenic for Man

Laboratory exercises and seminars. *Two three-hour sessions each week, fourth period.* Dr. Murray, Dr. Vinson and Dr. Fraser.

Credit 2 units.

This course consists of laboratory sessions and seminars which provide an understanding of the techniques available for study of the growth and the characteristics of representative strains of rickettsiae, bedsoniae, and viruses which are human pathogens. Each student performs the procedures for identification and characterization of unknown pathogens under supervision of the Staff.

Prerequisite: Microbiology 204c or equivalent.

Enrollment is limited to ten students with prior approval of the Instructor.

Microbiology, Tropical Public Health and Epidemiology 214c,d. Case Studies in Epidemiology of Infectious Disease

Seminars and laboratory exercises. *One two-hour session each week, third and fourth periods.* Dr. Mack, Dr. Morrow, Dr. Langmuir and Dr. Nichols.

Credit 2 units.

This course is constructed to provide experience in solving epidemiologic problems in communicable and other acute disease situations. Epidemics of such disease entities as hepatitis, abovirus infections, and smallpox are studied in seminars with emphasis on a commitment by the participants.

Microbiology 215d. Problems in Medical Bacteriology

Seminars and laboratory demonstrations. *One three-hour session each week, fourth period.* Dr. Campbell, Staff of the Department and Visiting Lecturers.

Credit 1 unit.

Bacteriologic problems of particular interest to students, which were not

considered in Microbiology-Tropical Public Health 201a,b, are discussed. The content of the course is assembled around the students' interests. Requests from at least six individuals are needed if the course is to be held; these should be submitted to the Instructor prior to the end of the second quarter.

Microbiology 216c. Sexually Transmitted Diseases

Lectures and Seminars. *One two-hour session and three hours of individual clinic, field, or library work each week, third period.* Dr. VINSON, Dr. MULL and Guest Lecturers.

Credit 2 units.

The sexually transmitted diseases are fairly easily diagnosed and readily cured and yet they are out of control. Possible reasons for this enigma are examined in this course, which reviews the epidemiologic and medical aspects of the sexually transmitted diseases and examines the social matrix in which they occur and in which control is attempted. Because of the complex biosocial setting in which these diseases are transmitted, diagnosed, treated, and reported and in which sex contacts are traced, the course will include lectures and discussions of sexual behavior, psychology of sex, attitudes of professionals towards venereal diseases and venereal disease patients, as well as legal aspects and economics of control. Unsolved problems abound in attempts to control these diseases. Each student is expected to select a problem for solving or a problem area for studying in depth.

Microbiology 300a,b,c,d. Tutorial Programs

Time and credit to be arranged. Staff of the Department.

Enrollment requires the consent of the staff member responsible for supervision of the research. The various subject areas are listed below by category.

301 *Pathogenic Fungi*, Dr. CAMPBELL.

Biological, immunological and chemical characterization of the antigenic mosaic of *Histoplasma capsulatum* and other respiratory mycotic agents, involving electrophoretic and other recently developed immunologic procedures; serologic diagnosis of the respiratory mycoses including complement fixation, immunodiffusion and other serologic tests; basic studies on the agents, i.e., nutritional requirements, physiology, dimorphism, and morphogenesis.

Microorganisms available for study: an extensive collection of all pathogenic fungi, especially those producing systemic disease.

302 *Rickettsiae*, Dr. MURRAY and Dr. VINSON.

The qualified student may elect to study the biologic and immunologic characteristics of rickettsiae in the laboratory as well as to be associated with ongoing research in the field. Microorganisms under study in the Department

include the rickettsiae of typhus fever, Rocky Mountain spotted fever, scrub typhus and trench fever. Biologic characteristics of these organisms are being studied in animals, chick embryos, and cell cultures. The IgG, IgM and IgA immunoglobulin responses to these organisms are under investigation utilizing various immunochemical and serologic technics. Colonies of the human body louse and oriental rat flea are maintained in the laboratory for xenodiagnosis and transmission studies, and for studying host-parasite relationships and methods for control of anthropods. Rickettsial field projects are in progress in Yugoslavia, Tunisia, Mexico and Cape Cod, Massachusetts.

303 *Chlamydia*, Dr. Murray, Dr. Nichols and Dr. MacDonald.

Laboratory and field research in trachoma, inclusion conjunctivitis, psittacosis, lymphogranuloma venereum and the diseases caused by the chlamydial agents in humans and animals constitutes an opportunity to solve problems in an interesting and unusual microbiological area. Students are welcome to do laboratory and occasionally field investigations.

304 *Viruses*, Dr. Murray.

Isolation and identification of representative viruses by use of cell culture, animal inoculation, and serologic techniques.

305 *Immunochemical Methods*, Dr. MacDonald.

Experiments with immunofluorescence, chromatography, immunoelectro phoresis, ultracentrifugation, labelled isotopes and other techniques are being applied to research on microorganisms and mechanisms of hypersensitivity.

306 *Public Health Laboratory*, Associates at the State Laboratory Institute.

The State Laboratory Institute is engaged in a variety of procedures and studies related to public health programs. These include the development and testing of new serums and vaccines; the preparation, distribution and monitoring of the use of standards vaccines; research in various aspects of applied immunology; research, development and practical production of blood plasma fractions; various research possibilities related to a large diagnostic service in the fields of bacteriology, virology, the detection and study of congenital metabolic disorders; and field studies on the ecology of arboviruses. Individual arrangements for study can be made in any of these programs, depending on the student's needs, available time, and background.

307 *Tumor Biology*. Dr. Essex and Dr. Cerny.

Approaches and techniques for the study of cancer as an infectious disease. Procedures used to study tumor cell and tumor virus marker antigens and antibodies are demonstrated. The significance of these markers for epidemiological, etiological, and diagnostic investigations of various tumor systems of known and unknown cause are discussed. The relationship between the immune response and the oncogenic process is also examined.

308 *Antibody forming cells*. Dr. Cerny and Dr. Essex.

Differentiation of cells producing antibody of various classes *in vivo* and

in vitro. The studies involve the use of a number of immunological methods, but principally the agar plaque technique. The major experimental model utilized is immune response to cell wall antigens of *Vibrio cholerae*. The research also involves experiments on interaction between antibody forming cells and leukemic viruses in mice and studies on mechanism of virus-induced immunosuppression.

Microbiology 350. Research

Qualified doctoral candidates, research fellows, and full-time special students may register for Microbiology 350 to undertake original research in virology, rickettsiology, mycology, bacteriology, immunology, or in one of the disciplines under study at the State Laboratory Institute. A number of the current research activities of the Department of Microbiology are indicated under Course 300. Inquiries as to specific research opportunities should be addressed to the Head of the Department.

Department of Nutrition

Fredrick J. Stare, s.b., s.m., ph.d., m.d., a.m. (hon.), s.d. (hon.), d.sc. (hon.), Professor of Nutrition *and* Head of the Department

Robert P. Geyer, s.b., s.m., ph.d., Professor of Nutrition

D. Mark Hegsted, s.b., s.m., ph.d., a.m. (hon.), Professor of Nutrition

Jean Mayer, b.a., b.sc., m.sc., ph.d., d.sc., a.m. (hon.), m.d. (hon.), Professor of Nutrition *and* Lecturer on the History of Public Health

*Harry N. Antoniades, b.s., ph.d., Associate Professor of Biochemistry; *Senior Investigator, Blood Research Institute, Inc.*

Stanley N. Gershoff, a.b., s.m., ph.d., Associate Professor of Nutrition

M. Guillermo Herrera-acena, a.b., m.d., Associate Professor of Medicine

George R. Kerr, m.d., c.m., Associate Professor of Nutrition

Bernard Lown, s.b., m.d., Associate Professor of Cardiology in Public Health

Carl C. Seltzer, a.b., ph.d., Senior Research Associate in Biological Anthropology

Phin Cohen, a.b., m.d., Assistant Professor of Nutrition

Johanna T. Dwyer, s.b., s.m., s.m. in hyg., s.d. in hyg., Assistant Professor of Nutrition and Maternal and Child Health

Kenneth C. Hayes, a.b., d.v.m., ph.d., Assistant Professor of Nutrition

Agnes M. Huber, b.sc., ph.d., Assistant Professor of Nutrition

Shirley Warnock Thenen, a.b., ph.d., Assistant Professor of Nutrition

Nelson Priddy Westmoreland, b.v.s., d.v.m., ph.d., Assistant Professor of Nutrition

Niels E. Christiansen, a.b., a.m., ph.d., Research Associate in Sociology

Marjorie F. Elias, a.b., ed.m., ed.m., ed.d., Research Associate in Human Development

David L. Franklin, s.b., s.m., Research Associate in Systems Analysis

Robert Denis Lynch, a.b., s.m. in hyg., s.d. in nutr., Research Associate in Nutrition

*Joseph M. Miller, a.b., m.d., m.p.h., Research Associate in Medicine; *Senior Associate in Medicine, Peter Bent Brigham Hospital*

Jose O. Mora, m.d., s.m. in nutr., Research Associate in Nutrition

*Patricia S. Remmell, s.b., s.m., Research Associate in Nutrition

Kenneth W. Samonds, s.b., s.m., ph.d., Research Associate in Nutrition

* Part-time in the School of Public Health.

*James D. Simon, s.b., ph.d., Research Associate in Nutrition; *Associate Investigator, Blood Research Institute, Inc., Boston*

*Donald W. Thomas, a.b., a.m., ph.d., Research Associate in Psychology; *Assistant Professor of Psychology, Simmons College*

Richard L. Verrier, a.b., ph.d., Research Associate in Physiology

*Amnon Wachman, s.b., m.d., Research Associate in Medicine

*Robert L. Cannon, III, Consultant on Bioengineering; *Senior Engineer, American Optical Company*

Ezzat K. Amine, b.sc., s.m. in hyg., s.d. in nutr., Research Fellow in Nutrition

Paul E. Araujo, s.b., s.m., ph.d., Research Fellow in Nutrition

Paul J. Axelrod, s.b., m.d., Research Fellow in Cardiology

Allan Frederick Calvert, m.b.,b.s., Research Fellow in Cardiology

Guillermo Alfredo Cook, m.d., Research Fellow in Cardiology

Ramon Corbalan, m.d., Research Fellow in Cardiology

Etienne Jean-Paul Couturier, m.d., Research Fellow in Nutrition

Vladimir M. Jelinek, m.b., b.s., m.d., m.r.a.c.p., Research Fellow in Cardiology

Ernest Lengle, a.b., ph.d., Research Fellow in Nutrition

Judith A. Marlett, s.b., ph.d., Research Fellow in Nutrition

Michael Joseph Ryan, Jr., s.b., m.d., Research Fellow in Cardiology

Veena Chaudhri Saini, a.b., s.m., ph.d., Research Fellow in Nutrition

Eduardo Ruben Seroppian, m.d., Reearch Fellow in Cardiology

Warren M. Strauss, a.b., m.d., Research Fellow in Cardiology

John V. Temte, s.b., ph.d., m.d., Research Fellow in Cardiology

Ira William Weiss, b.m., sci., m.d., Research Fellow in Cardiology

Dorothy Bruno, s.b., Assistant in Nutrition

*Ethel J. Duffett, s.b., Assistant in Nutrition

Thomas P. Faherty, Assistant in Microscopy

Anna G. Gallagher, Assistant in Nutrition

Jelia C. Witschi, s.b., s.m., Assistant in Nutrition

James H. Shaw, b.a., s.m., ph.d., a.m. (hon.), *Professor of Nutrition, Harvard School of Dental Medicine*

Daniel S. Bernstein, a.b., m.d., *Associate Professor of Medicine, Harvard Medical School*

Ronald D. Hunt, s.b., d.v.m., *Principal Associate in Pathology, Harvard Medical School*

The Department of Nutrition is concerned with basic and applied investigations in the science of nutrition in the areas of biochemistry, physiology, pathology, and psychology. Many of these are oriented toward problems of contemporary public health importance, such as cardiovascular diseases, obesity, and osteoporosis. The Department also has programs dealing with general nutritional and health problems in various countries in South America, Africa, and Asia.

In addition to the courses available in the School of Public Health, students may take graduate courses in the other Schools of Harvard University and at the Massachusetts Institute of Technology. Thus, a program leading to the Doctor of Science degree might include courses in nutrition, biochemistry, biostatistics and epidemiology, physiology, and bacteriology, as well as advanced courses in these and related fields, such as organic and physical chemistry and biology. Appropriate programs are available at the Doctoral level for individuals whose interests lie in community nutrition rather than in laboratory nutrition and biochemistry.

Candidates for the Master of Public Health degree who elect to concentrate in Nutrition are normally expected to take the following courses in addition to satisfying the formal course requirements for the degree:

Nutrition 201a, 201b and at least one other course offered by the Department of Nutrition.

Nutrition 201a, 201b. Public Health Nutrition

Lectures. *One two-hour session each week, first and second periods.* Dr. MAYER and Dr. GERSHOFF.

Credit 1 unit in each period.

This course deals with human nutrition and the application of nutrition programs to problems of human health. The "a" period will be concerned primarily with nutrition problems of developing countries, while the "b" period will be directed towards nutrition problems and programs in industrialized countries. The "a" period will include such topics as nutritional requirements, famine, nutritional deficiency diseases, the assessment of nutritional status, and the relationship of food and nutritional programs to national development. The "b" period will include such topics as obesity, nutrition and cardiovascular disease, food safety, nutrition and the consumer, nutrition programs in the United States, and the role of regulatory agencies in public health nutrition.

Nutrition 202b,c,d. Departmental Seminar

Seminars. *Two one-hour sessions each week, second, third and fourth periods.* Dr. HUBER and Staff of the Department.

Credit 3 units.

Students are expected to summarize and criticize recent publications on assigned topics in nutrition. Attention is placed on validity of experimental designs in nutritional research. Topics include the biochemical, physiological, psychological, and sociological aspects of nutrition.

Nutrition 203a,b,c,d. Advanced Topics in Nutrition

Lectures, discussions and required reading. *Two two-hour sessions each week, first, second, third and fourth periods.* Dr. HAYES, Dr. HUBER, and Staff of the Department.

Credit 10 units.

The nutritional aspects of metabolism of carbohydrates, fats, proteins, vitamins, and minerals are considered in detail. Pathology of nutrient deficiency, imbalance, and toxicity are discussed. Mechanisms of regulation and behavioral aspects of food and fluid intake are examined. The effects of nutritional status on organs including the gastrointestinal tract, liver, muscle, kidney, and bone are discussed. Interrelationships between nutrition and hormone metabolism including insulin-glucagon, growth hormone, corticosteroids, sex hormones, and thyroxine are covered.

This course is required of all Master of Science and doctoral students majoring in nutrition but can be taken by other adequately prepared students with the consent of the Instructors.

Nutrition 204c,d. Laboratory and Animal Research Techniques

Lectures and demonstrations. *One three-hour session plus two additional hours each week, third and fourth periods.* Dr. GEYER, Dr. ANTONIADES and Staff of the Department.

Credit 5 units. Students not majoring in Nutrition may elect fewer hours with a commensurate decrease in credit units.

By means of discussions, laboratory work, and tutorial instruction this course affords the opportunity to learn the principles and practice of modern experimental animal and laboratory research techniques. The schedule is so arranged as to allow the student to simultaneously participate in a variety of on-going research projects involving animals and/or mammalian cell cultures, and to conduct instrumental and non-instrumental laboratory procedures.

Part one is tutorial in nature and involves the care of experimental animals and/or cell cultures, the preparation of experimental diets and culture media, and the rationale and means of carrying out nutritional and metabolic experiments with animals and/or mammalian cells. Included are balance studies, turnover of cell and tissue components, dietary induction of atherosclerosis, biochemical alterations in nutritional deficiencies and hyper-nutritional states, and regulation of enzyme activity levels in animals. Part two is formal instruction in the use of laboratory instruments and methods such as colorimetry; ultra violet, visible, and infrared spectrophotometry; fluorimetry;

flame and atomic ion absorption photometry; liquid scintillation and Geiger radioactivity assays; ultracentrifuge techniques; thin layer, column, and gas-liquid chromatography; immunoassay techniques; and manometric procedures. Samples and specimens obtained in part one will be used in conducting the experiments done in part two. In this way the various techniques are learned under conditions which yield data concerning actual research projects.

Nutrition 206c,d. Nutritional Aspects of Human Disease

Lectures, discussions and demonstrations. *One two-hour session each week, third and fourth periods.* Dr. KERR and Staff of the Department.

Credit 2 units.

This course reviews the role of specific nutrients in the causation and therapy of clinical disease. The course work consists of assigned reading of background material, and concepts of current controversy of importance to human biology and behavior presented in seminar format. By review of such selected disease entities as atherosclerosis, obesity, diabetes, anemias, and phenylketonuria, the course will consider nutrition-related disorders of appetite, ingestion of excess or insufficient amounts of nutrients, malabsorption, nutrient transport, and intermediary metabolism. The nutritional correlates of development, aging, infection, poverty and malignancy will also be reviewed.

In addition to considerations of the primary care of individuals with these disorders, emphasis will also be given to public health concepts of education, prevention and early detection of nutritional disease, and of the role of governmental agencies in developing screening programs and establishing criteria of adequate care.

Maternal and Child Health and Nutrition 207a,b. Nutrition in Child Growth and Development

Lectures and discussions. *One two-hour session each week, first and second periods.* Dr. DWYER and Visiting Lecturers.

Credit 2.5 units.

Principles and practical problems encountered in maternal and child nutrition are presented in this course. Its design is to help students make judgments based on the relevant scientific evidence on such questions as: optimum weight gain during pregnancy and situations calling for dietary modifications in pregnancy; effects of malnutrition on physical and mental growth and development; interrelationships between nutrition and infectious disease during early life; indications for and against breast feeding; factors governing the formulation of infant diets; the treatment of feeding disorders and of children and adolescents with special nutrition problems; and programs or services available for getting food, money for food, or help to those at risk of poverty-induced malnutrition.

Students will gain practical experience in the interpretation of food balance sheets, tables of food composition, and nutrition survey data; in the determination of which evaluation techniques should be applied to specific nutrition problems; and in critical review of the nutrition literature.

Lectures will concentrate on general principles; discussions will deal with a variety of practically oriented case studies and simulations illustrative of problems in both developing and highly industrialized nations concerning nutrition. A report related to the student's interests entailing roughly fifteen hours of student time will be required.

Nutrition 300a,b,c,d,e. Tutorial Programs

Time and credit to be arranged.

Individual work, under direction, may be arranged for students at the master's level. This may include laboratory studies or projects in applied nutrition.

Nutrition 350. Research

Time and credit to be arranged.

Facilities are available for students at the doctoral level to do advanced work in nutrition along the lines of fundamental research or applied nutrition in public health and medicine. Areas currently receiving intensive and comprehensive study in the Department are as follows:

The effect of nutrition and other environmental factors on the etiology of heart disease in man; nutrition education; fluoride in human nutrition as a preventive for tooth decay and osteoporosis; cooperative international researches in nutrition. (Dr. Stare)

The nutritive value of proteins and protein requirements; dietary effects on the metabolism of cholesterol in animals and man; the influence of diet on the metabolism of adipose tissue; nutritional requirements for calcium and for bone formation. (Dr. Hegsted)

Neurophysiological, behavioral, and metabolic aspects of the regulation of food intake in animals; experimental obesity; anthropological, metabolic, and behavioral studies of obesity in children and adolescents; psychological aspects of nutrition in man. (Dr. Mayer)

Lipid metabolism in tissue culture cells; polyvalent metal metabolism in soft tissue; effects of CO_2 deprivation on tissue culture cells, parenteral nutrition and artificial blood substitutes. (Dr. Geyer)

The effects of nutritional deficiencies on endocrine metabolism; the etiology of urolithiasis in experimental animals and man; vitamin metabolism; interrelationships between nutrition and endocrine function. (Dr. Gershoff)

Coronary artery disease; etiology of sudden death; derangements of the heart beat; exercise physiology; electrolyte metabolism. (Dr. Lown)

Protein isolation and characterization; hormone biochemistry and metabolism. (Dr. Antoniades)

Endocrine, nutritional, and metabolic aspects of diabetes and hyperlipidemia (Dr. Herrera-Acena)

Mental development and learning capacity as affected by malnutrition.

Lipid metabolism in human platelets; energy substrate metabolism related to the problem of platelet preservation. (Dr. Cohen)

Investigation of certain physiological, psychological, and cultural factors affecting obesity, dieting, and weight control efforts, relationships between nutrition knowledge and various groups and their eating practices; evaluation of the effectiveness of nutrition education; evaluation of feeding programs. (Dr. Dwyer)

Nutritional pathology and the fat-soluble vitamins with specific interest in lipid metabolism, atherosclerosis, and metabolic bone disease. (Dr. Hayes)

Zinc metabolism. (Dr. Huber)

Primatology, particularly nutrition as it relates to fetal development. (Dr. Kerr)

Biochemistry of folic acid and vitamin B_{12} in relation to hemopoiesis or central nervous system function. Metabolic aspects of genetic obesities in animals. (Dr. Thenen)

Electron miscroscopic morphology and histochemistry of atherosclerosis, smooth muscle cells in tissue culture, arterial connective tissue and blood thrombi produced by the injection of Factor XIIa. (Dr. Westmoreland)

Admission is limited and is subject to the approval of the Instructor.

Department of Physiology

James L. Whittenberger, s.b., m.d., a.m., (hon.), James Stevens Simmons Professor of Public Health, Professor of Physiology *and* Head of the Department

†Benjamin G. Ferris, Jr., a.b., m.d., Professor of Environmental Health and Safety; *Director of Environmental Health and Safety, University Health Services*

Jere Mead, s.b., m.d., Professor of Physiology

Mary O. Amdur, s.b., ph.d., Associate Professor of Toxicology

David E. Leith, a.b., m.d., Associate Professor of Physiology

John B. Little, a.b., m.d., Associate Professor of Radiobiology

*Robert B. McGandy, a.b., m.d., m.p.h., Associate Professor of Physiology

Sheldon D. Murphy, s.b., ph.d., Associate Professor of Toxicology

John M. Peters, s.b., m.d., m.p.h., s.d. in hyg., Associate Professor of Occupational Medicine

Joseph D. Brain, a.b., s.m., s.m. in hyg., s.d. in hyg., Assistant Professor of Physiology

Stanley V. Dawson, s.b., s.m., s.d. in hyg., Assistant Professor of Environmental Health Engineering

John D. Dougherty, a.b., m.d., m.p.h., s.d. in hyg., Assistant Professor of Environmental Health and Safety

Philip I. Hershberg, b.e.e., m.e.e., m.d., Assistant Professor of Medicine

Frederic G. Hoppin, Jr., a.b., m.d., Assistant Professor of Physiology

*Raymond L. H. Murphy, Jr., s.b., m.d., m.p.h., s.d. in hyg., Assistant Clinical Professor of Occupational Medicine; *Director, Pulmonary Service, Faulkner Hospital*

Ronald M. Pickett, a.b., a.m., ph.d., Assistant Professor of Experimental Psychophysiology

Sergei P. Sorokin, a.b., m.d., Assistant Professor of Anatomy

Howard W. Stoudt, a.b., a.m., ph.d., s.m. in hyg., Assistant Professor of Physical Anthropology

Dwight W. Underhill, b.e., s.m. in hyg., s.d. in hyg., Assistant Professor of Environmental Health Engineering

* Part-time in the School of Public Health.
† Part-time in the School of Public Health, full-time in Harvard University.

*Charles A. Berry, A.B., M.D., M.P.H., Visiting Lecturer on Aerospace Medicine; *NASA Director for Life Sciences, Washington, D.C.*

*David W. Fassett, A.B., M.D., Visiting Lecturer on Occupational Medicine; *Director, Health and Safety Laboratory, Eastman Kodak Company*

*Harry Heimann, S.B., M.D., Visiting Lecturer on Occupational Medicine; *Research Professor of Community Medicine (Environmental Medicine), Mt. Sinai School of Medicine, New York*

Michael D. Goldman, A.B., M.D., S.M. in Hyg., S.D. in Phys., Research Associate in Physiology

Rudolph J. Jaeger, S.B., Ph.D., Research Associate in Toxicology

Michael S. Morgan, S.B. in Chem.E., S.D. in Chem.E., Research Associate in Physiology

*John M. Tyler, A.B., M.D., Research Associate in Physiology; *Chief of Professional Services, Lemuel Shattuck Hospital*

Jerry R. Williams, B.A., B.Sc., M.Sc., S.D. in Phys., Research Associate in Radiobiology

Mark E. Bradley, S.B., M.D., S.M., M.P.H., Research Fellow in Physiology

Pui-Chu Chan, A.B., Ph.D., Research Fellow in Radiobiology

Malcolm Green, B.A., B.Sc., B.M., B.Ch., M.A., M.R.C.P., Research Fellow in Physiology

Philip J. Gulesian, Jr., A.B., Research Fellow in Physiology

Franklin E. Mirer, A.B., A.M., Ph.D., Research Fellow in Toxicology

Ruth B. Cherry, A.B., A.M., Assistant in Physiology

Helene Vetrovs, Assistant in Radiobiology

Robert G. Monroe, A.B., M.D., *Associate Professor of Pediatrics, Harvard Medical School*

Frank E. Speizer, A.B., M.D., *Assistant Professor of Medicine, Harvard Medical School*

Mary Ellen Beck Wohl, M.D., *Assistant Professor of Pediatrics, Harvard Medical School*

The Department of Physiology has interests which include physiology as a basic medical science. The Department's concerns, however, extend beyond pure physiology to encompass a broad spectrum of environmental health problems for which physiologic and biochemical knowledge and techniques are necessary tools. The biologic effects of air pollutants, of pesticides, and of radiation are typical problems that have been central to the Department's

interests. Such broad problems require the insights of many specialties and the personnel of the Department reflect this multi-disciplinary approach. The staff of the Department includes physicians, physiologists, psychologists, physical anthropologists, health and safety specialists, engineers, toxicologists, and specialists in radiobiology, occupational and aerospace medicine. Students and Research Fellows come with similarly varied backgrounds.

A major objective of the Department is to provide students with basic information on the relationship of man to his physical and chemical environment. The course Environmental Health Interdepartmental 201a, 201b introduces M.P.H. candidates to fundamental concepts regarding the measurement of both the quality of the environment and its impact on man. These concepts are examined in detail in specialized courses such as Environmental Physiology, Principles of Toxicology, Radiation Biology, and Human Factors in Occupational Performance and Safety. Specific research projects of members of the Department offer students an opportunity to gain experience in, and to develop a capacity for, critical evaluation of research methods. Qualified individuals may enroll in a program leading to a doctoral degree.

The research programs include topics such as cellular effects of ionizing radiation, mechanisms of carcinogenesis and mutagenesis, toxic interactions of particles and vapors, inhalation toxicology, pesticide metabolism and toxicity, enzyme induction, comparative respiratory physiology, and the deposition and clearance of particles in the respiratory tract. Other research areas are the elastic properties of the lungs and chest wall, mechanisms of flow limitation, role of lung surfactant, human factors in transportation safety, causation of chronic non-specific respiratory disease, exercise and work physiology and factors involved in fitting the machine and work environment to the capabilities of human performance.

Physiology 203a,b. Human Physiology

Lectures and conferences. *Two two-hour sessions each week, first and second periods.*

Laboratory and demonstrations. *One two-hour session each week, first and second periods.* Dr. Brain and Staff of the Department.

Credit 5 units.

This course presents basic physiological processes which characterize living cells, organs, organ systems, and whole organisms as they respond to a changing environment. Topics covered include cell structure and physiology, genetics, circulation, gas exchange, endocrinology, neurophysiology, fluid and solute exchange, and general pathology. The laboratory work and demonstrations will be correlated with the lectures and are intended to give students some experience with the problems and satisfactions of observing living systems.

Prerequisites: College courses in physics, chemistry, and mathematics, or

permission of the Instructor. This course is suitable for students who lack a background in physiology or biology.

Physiology 204c. Environmental Physiology

Lectures and conferences. *One two-hour session each week, third period.* Dr. Leith and Staff of the Department.

Credit 1 unit.

This course deals with limits and limiting mechanisms of responses, adaptation, performance and tolerance of living organisms under stresses imposed by their physical, chemical, and biological environments. Exercise, altitude and diving, high and low temperatures and humidities, and other topics are included. Course content and structure are flexible.

Prerequisite: Master of Science candidates who wish to take this course must have had Physiology 203a,b or the equivalent.

Physiology 205c, 205d. Principles of Toxicology

Lectures and laboratory demonstrations. *Two two-hour sessions each week, third and fourth periods.* Dr. Amdur and Dr. Murphy.

Credit 2.5 units in each period.

This course deals with the toxic effects of exposure of living organisms to foreign chemicals. The first period includes discussions of the history and basic principles of experimental toxicology, the methods used in toxicologic research and safety evaluation studies and the biochemical and physiologic response of tissues, organ systems, and intact animals to toxic chemicals. Two or three laboratory sessions are included.

During the second period emphasis will be placed on the practical applications and implications of information derived from experimental toxicology for problem areas in public health. These will include the use of toxicologic information by regulatory agencies and discussion of toxicologic information on pesticides, air and water contaminants, industrial chemicals, drugs, food additives, and natural products. The orientation will be toward the usefulness of existing data and the need for further toxicologic research.

The entire course is required of students majoring in toxicology and should be of value to other students who expect to be involved in research or administration that may include some aspects of toxicology. The "d" period may be taken separately by students with a bio-medical background who are primarily concerned with the application of toxicologic information to practical public health problems.

Prerequisites: College chemistry and biology courses, Physiology 203a,b or permission of the Instructors.

Physiology 207c,d. Radiation Biology

Lectures. *Three one-hour sessions each week, third and fourth periods.*

Laboratory. *One two-hour session each week, third and fourth periods.* Dr. Little.

Credit 5 units.

This course deals with the biological effects of ionizing radiation and is divided into two parts, cellular and mammalian radiation biology. Included in the first will be a discussion of elementary target theory, radiation chemistry, effects on macromolecules, cellular and chromosomal effects, UV-photobiology, and cellular and molecular repair processes. The second part covers the acute and long-term effects of radiation in man. The biologic basis of the acute radiation syndrome, and the human epidemiologic data for radiation carcinogenesis will be emphasized, as well as a discussion of environmental sources of radiation and the characteristics of internal and external human exposure.

This course is designed to be compatible with and to follow Nuclear En-

gineering 22.55 (Biological Effects of Nuclear Radiation) offered in the fall term at M.I.T. by Professor G. L. Brownell.

Prerequisite: Physiology 203a,b, or equivalent. The lectures (3 credit units) may be taken without the laboratory with consent of the Instructor. The laboratory will not be offered for less than 5 students.

Physiology 208a,b. Seminar in Toxicology

Lectures and seminars. *One two-hour session each week, first and second periods.* Dr. MURPHY and Dr. AMDUR.

Credit 2 units.

The purpose of this course is to acquaint students with current problems in toxicologic research and to stimulate in-depth discussion of mechanisms of action and metabolism of toxic chemicals. Following a series of introductory lectures on problems in toxicology, students will be expected to review the literature on an assigned topic in basic toxicologic research and to present a critical summary for class discussion. Broad topic areas will include metabolism of toxic chemicals, target sites and mechanisms of toxic action, structure-activity relationships, toxicologic interactions and functional-morphological relationships. The topics covered will vary from year to year and students majoring in toxicology will be expected to register each year. It is recommended that other students who wish to offer toxicology as an area for doctoral examinations register for at least one year. Two or three hours per week of outside reading will be required.

Enrollment is subject to the approval of the Instructor.

Physiology 300. Tutorial Programs

Time and credit to be arranged.

Opportunities are provided for tutorial work at a master's degree level in the fields of respiratory physiology, toxicology, occupational medicine, and radiobiology.

Physiology 350. Research

Doctoral candidates and other properly qualified students may undertake laboratory or field research by arrangement with the Head of the Department.

Natural Sciences 133. The Human Organism

This course, which is presented in Harvard College, is open to properly qualified students in the School of Public Health.

Half course (*spring term*). *M., W., and F. at 10, and six two-hour section meetings at hours to be arranged.* Dr. BRAIN and Staff of the Physiology Department.

An introduction to the physiological aspects of human birth, life, disease,

and death and a consideration of major issues in the causes, diagnosis, treatment, and prevention of disease. This course includes a survey of basic physiological processes which characterize human cells, organs, organ systems, and organisms as they respond to a changing environment. Topics include cell structure and physiology, genetics, circulation, gas exchange, endocrinology, neurophysiology, fluid and solute exchange, embryology, and general pathology. Cancer, aging, and infectious disease as well as the diagnosis and treatment of disease are also introduced.

Note: Fulfills one half of the basic General Education requirement in Natural Sciences.

Prerequisites: At least a high school course in biology; high school physics and chemistry and a previous college-level science course is strongly recommended.

Department of Population Sciences

Hilton A. Salhanick, A.B., A.M., PH.D., M.D., Frederick Lee Hisaw Professor of Reproductive Physiology *and* Head of the Department; *Professor of Obstetrics and Gynecology, Harvard Medical School*

John C. Snyder, A.B., M.D., LL.D., Professor of Population and Public Health *and* Medical Director, Center for Population Studies

Arthur J. Dyck, A.B., A.M., PH.D., Mary B. Saltonstall Professor of Population Ethics; Member of the Center for Population Studies; *Member of the Faculty of the Harvard Divinity School*

Roger Revelle, A.B., PH.D., S.D. (hon.), A.M. (hon.), L.H.D., Richard Saltonstall Professor of Population Policy and Director of the Center for Population Studies

Harold A. Thomas, Jr., S.B., S.M., S.D., Gordon McKay Professor of Civil and Sanitary Engineering

Warren L. Berggren, S.B., M.D., M.P.H., DR.P.H., Associate Professor of Tropical Public Health and Population Sciences

John B. Wyon, B.A., M.B., B.CH., M.P.H., Senior Lecturer on Population Studies

Stephen J Plank, PH.B., A.B., M.D., M.P.H., DR.P.H., Lecturer on Population Studies

*E. Noel McIntosh, S.B., M.D., S.M. IN HYG., Assistant Professor of Population Sciences; *Director of Human Reproduction Unit, Boston Hospital for Women*

Thomas W. Pullum, A.B., A.M., S.M., PH.D., Assistant Professor of Demography; Member of the Center for Population Studies

Henry W. Vaillant, A.B., M.D., S.M. IN HYG., Assistant Professor of Population Studies (Absent 1972–73)

*Joel E. Cohen, A.B., A.M., PH.D., M.P.H., Lecturer on Population Sciences; *Assistant Professor of Biology, Harvard University*

James D. Gavan, B.SC., S.M., PH.D., Lecturer on Population Sciences; Research Associate in Population Studies, Center for Population Studies; *Lecturer on Economics, Department of Economics, Harvard University*

*Rodrigo Guerrero, M.D., S.M. IN HYG., DR.P.H., Instructor in Population Sciences; *Acting Chairman of Department of Social Medicine, University of Valle, Colombia*

*Gretchen M. Berggren, A.B., M.D., S.M. IN HYG., Research Associate in Population Sciences

* Part time in the School of Public Health.

*Hugh R. Holtrop, s.b., m.d., Research Associate and Lecturer on Population Studies; *Associate Professor of Obstetrics and Gynecology, Boston University School of Medicine*

*Maria L. Milanesi, m.d., Research Associate in Population Studies

Vytautas I. Uzgiris, a.b., s.b., m.d., ph.d., Research Associate in Population Studies

Carmen A. Whipple, b.s., m.a., ph.d., Research Associate in Population Studies

*David Charles, m.b., b.s., Consultant on Human Reproduction; *Professor and Chairman, Department of Obstetrics and Gynecology, Boston University School of Medicine; Lecturer on Obstetrics and Gynecology, Harvard Medical School*

*Richard B. Gamble, a.b., a.m., Consultant on Population Problems; *Executive Director, The Pathfinder Fund.*

*Alfredo Goldsmith, m.d., m.p.h., Consultant on Population Problems; *Medical Director, The Pathfinder Fund.*

*Jack M. Goldstein, a.b., s.b., s.m., ph.d., Consultant on Instrumentation; *Staff Scientist, Fisher Research Laboratories*

*Duncan E. Reid, s.b., m.d., a.m. (hon.), Consultant on Human Reproduction; *Kate Macy Ladd Professor of Obstetrics and Gynecology, Harvard Medical School*

*Clayton L. Thomas, s.b., m.d., m.p.h., Consultant on Human Reproduction; *Vice President of Medical Affairs, Tampax, Incorporated*

Kiyoko Kashiwagi, b. pharm., Research Fellow in Population Sciences

Trinidad S. Osteria, b.a., m.a., s.d., Research Fellow in Population Studies

Julian M. Strauss, s.b., d.v.m., m.p.h., Research Fellow in Population Sciences

The advances of the past century in science, technology, and economic development have revealed unprecedented opportunities for improving the quality of life for much of mankind. Among these opportunities are several in the field of public health which have been the basis for large-scale programs aimed at prevention and control of major diseases, such as malaria and smallpox. But the striking successes in reducing morbidity and mortality from epidemic diseases have not been consistently accompanied by improvement in the conditions of life. Rapid expansion of population in many parts of the world is thwarting the current efforts to provide better housing, education, nutrition, health services and medical care. The disparity between rates of population increase and rates of development of human and economic resources is a crucial problem confronting society.

Acting under the conviction that the health professions can and should participate in general efforts to improve the quality of human life, the School of Public Health established the Department of Demography and Human Ecology in 1962 (renamed the Department of Population Sciences in 1969) and the Center for Population Studies in 1964.

The formal courses and the tutorial instruction of the Department are planned to prepare students for effective participation in population programs as administrators, research workers, or educators. The Department has developed courses of instruction in the biological and social processes which influence population change, in the means available to control human fertility, and in the physiology of reproduction.

The courses of instruction listed below are those intended primarily for students enrolled in the School of Public Health, but may be elected by students in other parts of Harvard or by other qualified persons who fulfil the criteria for admission as special students.

Candidates for the degree of Master of Science in Population Sciences should direct inquiries concerning their programs to the Head of the Department.

Candidates for the Master of Public Health degree who elect to concentrate in Population Sciences are normally expected to take most of the following courses:

Population Sciences 200a,b; Population Sciences 202c,d; Population Sciences 203c; Population Sciences 204c,d; Population Sciences 205c,d; Population Sciences 207c,d; and Population Sciences 330e.

Population Sciences 200a,b. Determinants, Consequences, and Control of Population Growth

Lectures and seminars. *Two one-hour sessions each week, plus one two-hour seminar/laboratory session every week, first and second periods.* Dr. PLANK, Dr. VAILLANT and Dr. MCINTOSH.

Credit 5 units.

The determinants of population growth are births, deaths, and migrations. The bio-social forces regulating each of these are examined, and the consequences of continued rapid population increase and alternative projections are considered. The control of natality as a major public health responsibility receives special attention. The physiology of reproduction is reviewed and methods and programs for its control are evaluated. The ethical and policy issues of limiting births and population growth are also discussed. Concepts are illustrated by historical and current references and applied by the students. A term paper is required.

Population Sciences 201a,b. Determinants, Consequences, and Control of Population Growth

Lectures. *Two one-hour sessions each week, first and second periods.* Dr. PLANK, Dr. VAILLANT and Dr. MCINTOSH.

Credit 2.5 units.

This course consists of the lecture series for course 200a,b. It is intended only for those students who are not concentrating in the Department of Popu-

lation Sciences and who are unable to fit the full course (200a,b) into their schedules.

Population Sciences 202c,d. Departmental Seminar

Seminars. *One two-hour session each week, third and fourth periods.* Staff of the Department.

Credit 2 units.

This course is oriented toward the research interests of those concentrating in the department. Each student selects a topic for special study on which he presents a critical survey of the relevant literature and later the design of a project which would provide new information. During the initial sessions, and on occasion thereafter, staff members and guests report on their own investigations.

Population Sciences 203c. Demographic Methods

Lectures. *One two-hour session and one one-hour session each week, third period.*

Laboratory. *One two-hour session each week, third period.* Staff of the Department.

Credit 2.5 units.

A course on demographic methods with emphasis on the correction of vital statistics and census data, measurement of nuptiality, fertility, contraceptive effectiveness and population growth, and on the preparation of population projections.

Prerequisite: Biostatistics 101a,b.

Population Sciences 204c,d. Biological Basis for Fertility Control

Lectures. *Two one-hour sessions each week with a third hour at the discretion of the Instructor, third and fourth periods.* Dr. SALHANICK and Staff of the Department.

Laboratory. *Six two-hour sessions to be arranged.*

Credit 5 units.

This course presents the fundamental physiology and biochemistry related to known and potential methods of family planning. It will cover: the biosynthesis, secretion, effects and modes of action of the gonadal and gonadotropic hormones; relationship of the natural steroid hormones to synthetic analogues; relationships of chemical structure to physiologic activity of the contraceptive steroids; the human menstrual cycle and early pregnancy; psychological factors related to the successful practice of contraception; and abortion. Laboratory sessions will include visits to a family planning clinic, a fertility and endocrine unit and, where possible, opportunity to witness operative procedures for sterilization and pregnancy termination.

Prerequisite: Population Sciences 200a,b and appropriate science background.

Population Sciences 205c,d. Readings in Population Studies

Seminars. *One two-hour session each week, third and fourth periods.* Staff of the Department.

Credit 2 units.

This course is an introduction to the literature pertaining to population theory, research, and fertility control programs. It is offered for students concentrating in the Department. Seminar discussions are directed toward the analysis and evaluation of the assigned selections.

Population Sciences 206c,d. Current Research on Population Problems

Seminars. *One two-hour session each week, third and fourth periods, and four to six hours each week supervised duty.* Dr. SNYDER.

Credit 2.5 units.

This course is designed for physicians and other health professionals with a biological background who are concentrating in population sciences at the School and who plan to do field work subsequently.

Each participant in the course selects one recently published paper on a topic of general interest; the paper is analyzed for presentation to and evaluation by those enrolled in the course.

The purpose of the course is to improve the ability of the participants to read current research reports analytically, to plan their own work effectively, and to prepare their manuscripts clearly and concisely.

Prerequisite: Population Sciences 200a,b or equivalent background.

Enrollment is by consent of the Instructor and limited to 12 participants.

Population Sciences 207c,d. Population Control Programs: Design, Management and Evaluation

Lectures and Seminars. *A one-hour lecture and a one-to-two-hour seminar each week, third and fourth periods.* Dr. WYON and Staff of the Department.

Credit 2.5 units.

Many countries and funding agencies support programs intended to decelerate population growth, but their effectiveness is controversial. This course reviews examples of existing programs and related research, investigates their conceptual basis, examines evidence for broader considerations, and attempts a synthesis along the lines suggested by the evidence. Accounts of field studies in the United States and in developing countries illustrate these principles.

Prerequisite: Population Sciences 200a,b, Biostatistics 101a,b, and Epidemiology 201a or equivalent background.

Population Sciences 210e. Evaluation and Management of the Infertile Couple

Lectures and Field Visits. *Daily lectures during the one-week reading period between the Fall and Spring terms.* Dr. McIntosh and Staff.

Credit 1 unit.

This course deals with the evaluation and management of the infertile couple and the desirability for providing infertility services in family planning programs. The organization and operation of an infertility unit will be discussed as well as methods for describing the population evaluated and the results obtained so that they can be meaningfully compared with the findings of others. Films of specific diagnostic procedures will be shown and a visit to the Fertility and Endocrine Unit at the Boston Hospital for Women will be made on the final day of the course.

Enrollment is limited and subject to the approval of the Instructor.

Prerequisite: This course is primarily intended for students who will be working in family planning programs. Population Sciences 200a,b and medical science background.

Population Sciences 300. Tutorial Programs

Time and credit to be arranged.

Students at the master's level may make arrangements for tutorial work and special reading on topics related to population problems. There may be an opportunity to consider the design of studies, programs or analysis of data.

Population Sciences 330e. Field Visits

One-week period between Fall and Spring terms or one-week period between Third and Fourth quarters.

Credit 1 unit.

Students concentrating in the Department of Population Sciences may participate in visits to organizations currently active in demographic studies, community education, and programs of research and service in fertility control.

Additional Field Study

At the end of the academic year, a field visit may be arranged for students majoring in the Department of Population Sciences.

Limited to ten students.

Population Sciences 350–356. Research

Candidates for doctoral degrees may undertake research in the Department or may integrate research in population sciences with a doctoral program in another department or at the Center for Population Studies.

Members of the Department and of the Center for Population Studies are currently engaged in research in the following areas:

350 *Topics in Field Studies and Programs*, Dr. Snyder, Dr. Wyon, Dr. Plank, Dr. Guerrero, and Dr. Berggren.

351 *Topics in Biomedicine and Reproductive Physiology*, Dr. Salhanick and Dr. McIntosh.

352 *Topics in Demography*, Dr. Keyfitz and Dr. Pullum.

353 *Topics in Population Ethics*, Dr. Dyck and Dr. Potter.

354 *Topics in Population Policy*, Dr. Revelle and Dr. Snyder.

355 *Topics in Population Economics*, Dr. Leibenstein and Dr. Dorfman. (Center for Population Studies)

356 *Topics in Population and Resource Interaction*, Dr. Revelle, Dr. Thomas and Dr. Rogers. (Center for Population Studies)

The following courses, which are presented in Harvard College, are open to properly qualified students in the School of Public Health. Consult the catalogue of the Faculty of Arts and Sciences for complete descriptions of these courses.

Biology 150. Population Models

Half course (*fall term*). *M., W., F., at 9.* Assistant Professor Cohen.

Economics 1221. Population and the Economy

Half course (*spring term*). Professor Mair.

Natural Sciences 118. Human Populations and Natural Resources

Half course (*fall term*). *M. and W., at 10, and one discussion hour to be arranged.* Professor Revelle.

Natural Sciences 119. Seminar on Population and Environment in the Urban Setting

Half course (*spring term*). *Hours to be arranged.* Professor Revelle.

Sociology 185. Applied Mathematical Demography

Half course (*fall term*). *M., W., F., at 2.* Professor Keyfitz and Assistant Professor Pullum.

Sociology 190. Ecology and the Spatial Distribution of Population

Half course (*spring term*). *M., W., and F. at 2.* Professor Keyfitz and Assistant Professor Pullum.

Sociology 192. Problems of Population

Half course (*fall term*). Professor Keyfitz and Assistant Professor Pullum.

Sociology 285. Seminar: Applied Mathematical Demography

Half course (*spring term*). *Tu. at 2.* Professor KEYFITZ and Assistant Professor PULLUM.

The following course, which is presented in the Harvard Divinity School, is open to properly qualified students in the School of Public Health. Consult the catalogue of the Harvard Divinity School for a complete description of this course.

Ethics 284. Seminar: Ethical Aspects of Population Policy

Half course (*spring term*). *Hours to be arranged.* Professors DYCK and POTTER.

The following course, which is presented in the Graduate School of Education, is open to properly qualified students in the School of Public Health. Consult the catalogue of the Graduate School of Education for a complete description of this course.

X–103. Issues in Population Education

Half course (*spring term*). *Time to be arranged.* Dr. KLINE.

Department of Sanitary Engineering

Harold A. Thomas, Jr., s.b., s.m., s.d., Gordon McKay Professor of Civil and Sanitary Engineering

J. Carrell Morris, s.b., a.m., ph.d., a.m. (hon.), Gordon McKay Professor of Sanitary Chemistry

Joseph J. Harrington, b.c.e., a.m., ph.d., Associate Professor of Environmental Health Engineering

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The following members of the Division of Engineering and Applied Physics of the Graduate School of Arts and Sciences participate in teaching in the School of Public Health:

Myron B. Fiering, a.b., s.m., ph.d., Gordon McKay Professor of Engineering and Applied Mathematics

Ralph Mitchell, b.a., ph.d., Gordon McKay Professor of Applied Biology

James N. Butler, s.b., ph.d., Gordon McKay Professor of Applied Chemistry

Lloyd A. Spielman, b.s., m.s., ph.d., Associate Professor of Environmental Engineering

Robert P. Burden, s.b., s.m., s.d., Co-Director of the Environmental Systems Program

The Courses in which members of this Department participate in the School of Public Health are listed under the Environmental Health courses on pages 99 and 102 (Environmental Health Interdepartmental 201a, 201b and 208a,b).

The following courses of instruction offered in the Division of Engineering and Applied Physics of the Graduate School of Arts and Sciences are open to properly qualified students:

Engineering Sciences 171 (formerly Engineering 271a). **Chemistry of the Aqueous Environment**

Half course (*fall term*). *M., W., F., at 11*, and laboratory, *F., 2–5*. Professor Butler.

Chemical principles applicable to environmental science and engineering. Physical chemistry of aqueous media with emphasis on solution and heterogeneous equilibria. Principles of analytical chemistry and their application to analysis of water. Sources, occurrence, and chemical reactions of important constituents in natural waters.

Prerequisites: A strong course in general chemistry; familiarity with elementary physical and analytical chemistry.

Engineering Sciences 173 (formerly Engineering 273a). **Introduction to Environmental Microbiology**

Half course (*spring term*). M., W., F., at 11, and laboratory hours to be arranged. Professor MITCHELL.

Introduction to Microbiology. Emphasis on microbial ecology. Application to problems in water pollution.

Note: This course cannot be taken for credit in addition to the former Engineering 273a.

Prerequisite: Biology 2 or Natural Sciences 5.

Engineering 250. Design of Water Resource Systems

Half course (*fall term*). *M., W., F., at 8.* Professor THOMAS.

Principles of engineering and economic analysis applied to water resource systems. Functional design of comprehensive management systems for collection, storage, conveyance, treatment and distribution of water. Techniques of operations research and econometrics are used in developing methods for planning integrated systems of dams, reservoirs, canals, pipe lines and networks, pumps, and treatment plants.

Prerequisites: Engineering Sciences 105a or Applied Mathematics 105a; Engineering Sciences 121, 123 or equivalents.

Engineering 250. Design of Water Resource Systems

Half course (*spring term*). *M., W., F., at 8.* Professor THOMAS.

Continuation of Engineering 250a with emphasis on non-linear systems and systems with stochastic components. Application to problems of water pollution and design of comprehensive programs for water quality management.

Prerequisite: Engineering 250a. Statistics 190 or equivalent is desirable.

Engineering 253. Stochastic Processes

Half course (*fall term*). *M., W., F., at 9.* Professor FIERING.

Theory and applications of stochastic processes and time series for environmental and social problems, including hydrology, delivery of medical care, statistical evaluation techniques, birth-death processes, hazard perception, insurance, and queues.

Prerequisites: Engineering 250a or Engineering Sciences 119; Statistics 190.

Engineering 268. Transport Phenomena

Half course (*spring term*). *M., W., F., at 9.* Associate Professor SPIELMAN.

Principles of convective and molecular transport of mass, momentum and energy in laminar and turbulent flows: emphasizes nonequilibrium systems

with strong coupling between physicochemical rate processes and hydrodynamics; forced and free convection; estimation of molecular transport coefficients; theory of the residence time distribution and its application to river and stream purification; processes of current significance in modern pollution control technology, including biological waste treatment, inorganic nutrient removal, and oil separation.

Engineering 270a. Engineering Systems for Environmental Control

Half course (*spring term*). *M., W., F., at 10.* Associate Professor HARRINGTON.

Provision of urban water; engineering aspects of the collection and disposal of spent water and solid wastes; significant interchanges between the gaseous, liquid and solid phases of the environment; geographic interchanges; time-dependent developments. Data collection and processing for monitoring and control; maintenance and operation of pollution control systems.

Prerequisite: Engineering Sciences 123.

Engineering 272. Water Quality and Its Management

Half course (*spring term*). *Tu., Th. 11–12:30.* Professor BUTLER.

Nature, sources and effects of inorganic and organic impurities in natural waters. Water quality standards. Effects of water use on quality. Natural purification of surface waters. Chemistry of water and waste-water treatment. Water renovation and reuse.

Note: This course cannot be taken for credit in addition to the former Engineering 271b.

Prerequisites: Engineering Sciences 173 and Engineering 271a or Engineering Sciences 171 should be taken concurrently.

Engineering 273. Water Pollution Microbiology

Half course (*fall term*). *Hours to be arranged.* Professor MITCHELL.

An advanced course in which the role of microorganisms both as pollutants and as purifying agents will be discussed. Particular attention will be given to ecological approaches to pollution control. Topics will include eutrophication, microbial imbalances, pesticides, stream purification, and a critical discussion of current waste treatment methods.

Prerequisite: Engineering Sciences 173 or equivalent.

Engineering 274. Chemical Models of Natural and Polluted Waters

Half course (*spring term*). *Hours to be arranged.* Dr. ———.

To be given in 1973–74.

Chemical aspects of aqueous environmental systems are discussed within the framework of mathematical modeling. These models are based primarily on

thermodynamic equilibrium, but can include kinetic processes and hydrodynamic processes as well. The emphasis is on developing realistic predictive models for actual cases encountered in water quality management, pollution control, limnology, oceanography, and geology.

Prerequisites: Physical chemistry (e.g. Engineering Sciences 171), and some experience in computer programming.

Engineering 275. Mechanics and Separation of Particulates

Half course (*fall term*). *M., W., F., at 11.* Associate Professor SPIELMAN.

Generalized approach suspended particles in water and air; precipitation and dissolution; mechanisms of particle capture in filtration; nonideal settling; kinetics of coagulation and the theory of self-preserving particle size spectra; principles of particle sizing and counting devices.

Prerequisite: Engineering 268, Engineering 228, or equivalent.

Engineering 277. Surface Chemistry

Half course (*fall term*). *M., W., F., at 10.* Professor MORRIS.

Liquid surfaces and surface-active materials. The Gibbs equation. Two-dimensional equations of state. Adsorption at solid surfaces. The colloidal state. Electrokinetic phenomena. Structure, surface properties, and colloidal behavior of hydrous oxides and silicate minerals.

Prerequisite: Engineering 271a.

Engineering 278. Reaction Rates and Mechanisms

Half course (*fall term*). *M., W., F., at 10.* Dr. ———.

To be given in 1973–74.

Chemical kinetics, with emphasis on reactions in aqueous systems, diffusion and enzyme-mediated processes. Interpretation of kinetic data. Inorganic reaction mechanisms.

Prerequisite: Engineering 271a, or equivalent.

Engineering 279. Applied Electrochemistry

Half course (*fall term*). *Hours to be arranged.* Professor BUTLER and Dr. MCKINNEY.

Dynamic interpretation of electrochemical processes. Electrode kinetics, the electric double layer, and electrokinetic phenomena. Applications to chemical processes, metallic corrosion, passivity, cathodic protection, batteries, fuel cells, and environmental science.

Prerequisite: Chemistry 60 or similar background.

Department of Tropical Public Health

Thomas H. Weller, a.b., s.m., m.d., ll.d., Richard Pearson Strong Professor of Tropical Public Health, Director of the Center for the Prevention of Infectious Diseases, *and* Head of the Department

Eli Chernin, s.b., a.m., s.d., a.m. (hon.), Professor of Tropical Public Health.

Warren L. Berggren, s.b., m.d., m.p.h., dr.p.h., Associate Professor of Tropical Public Health and Population Sciences

Edward H. Michelson, s.b., s.m., ph.d., Associate Professor of Tropical Public Health

Richard H. Morrow, Jr., a.b., m.d., m.p.h., Associate Professor of Tropical Public Health

Steve C. Pan, b.sc., m.d., m.p.h., Associate Professor of Tropical Public Health

Andrew Spielman, s.b., s.d., Associate Professor of Tropical Public Health.

Richard H. Daggy, s.b., s.m., ph.d., m.p.h., dr.p.h., Lecturer on Tropical Public Health *and* Associate Dean for International Programs

Peter Braun, s.b., m.d., Assistant Professor of Tropical Public Health

*Catherine Coolidge, a.b., m.d., m.p.h., Assistant Professor of Tropical Public Health.

*Neville R. E. Fendall, b.sc., m.r.c.s., l.r.c.p., m.b.,b.s., m.d., d.p.h., Visiting Lecturer on Tropical Health; *Professor of Tropical Community Health, Liverpool School of Tropical Medicine, England*

*Robert L. Kaiser, a.b., m.d., d.t.m. & h., Visiting Lecturer on Tropical Public Health; *Director, Malaria Program, National Center for Disease Control*

*Harry Most, s.b., m.d., d.t.m. & h., d.m.s., Visiting Lecturer on Tropical Public Health; *Herman N. Biggs Professor and Chairman, Department of Preventive Medicine, New York University School of Medicine*

*Franklin A. Neva, s.b., m.d., a.m. (hon.), Visiting Lecturer on Tropical Public Health; *Chief, Laboratory of Parasitic Diseases, National Institute of Allergy and Infectious Diseases, National Institutes of Health*

*Elvio H. Sadun, b.s., s.m., sc.d., Visiting Lecturer on Tropical Public Health; *Chief, Department of Medical Zoology, Walter Reed Army Institute of Research*

*Nevin S. Scrimshaw, a.b., a.m., ph.d., m.d., m.p.h., Visiting Lecturer on Tropical Public Health; *Professor of Nutrition and Head, Department of Nutrition and Food Science, Massachusetts Institute of Technology*

*David J. Sencer, m.d., m.p.h., Visiting Lecturer on Tropical Public Health; *Chief, National Center for Disease Control*

* Part-time in the School of Public Health.

*John M. Weir, s.b., m.d., ph.d., m.p.h., Visiting Lecturer on Tropical Public Health; *Consultant, The Rockefeller Foundation*

Monte P. Bawden, a.b., ph.d., Research Associate in Tropical Public Health

*Martin K. Escher, m.d., m.p.h., Clinical Research Associate in Tropical Public Health

Joseph L. Waner, s.b., s.m., ph.d., Research Associate in Tropical Public Health

Markley H. Boyer, a.b., m.d., d. phil., m.p.h., Research Fellow in Tropical Public Health

John D. Christie, s.b., s.m., ph.d., Research Fellow in Tropical Public Health

J. Stauffer Lehman, Jr., a.b., m.d., m.p.h., Research Fellow in Tropical Public Health

Leonard C. Marcus, b.s., d.v.m., m.d., Research Fellow in Tropical Public Health

Kenneth E. Mott, s.b., m.d., m.p.h., Research Fellow in Tropical Public Health

Susan K. Wheeldon, b.sc., a.m., Assistant in Tropical Public Health

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Gustave J. Dammin, a.b., m.d., a.m. (hon.), *Elsie T. Friedman Professor of Pathology, Harvard Medical School*

Franz C. von Lichtenberg, m.d., dr. (hon.), *Associate Professor of Pathology at the Peter Bent Brigham Hospital*

The health problems of the tropical regions, as in poorly sanitated areas of the world elsewhere, are predominantly of an infectious and nutritional nature. The infectious diseases are the primary concern of the Department of Tropical Public Health, with particular emphasis given to protozoal, helminthic, and viral entities and to relevant arthropod and molluscan intermediate hosts. Within the framework of the Center for Prevention of Infectious Diseases, the Department of Tropical Public Health shares with the Department of Microbiology the responsibility for an integrated presentation of information on important infectious agents that produce disease in man. Emphasis is given to the ecology and epidemiology of the major infectious diseases and to their prevention and control.

The resolution of the health problems of tropical areas, as elsewhere, requires not only a specific knowledge of diseases but a multidisciplinary approach involving a considered appraisal of human resources as well as of relevant social, economic, and political factors. This elemental concept underlies the teaching program of the Department of Tropical Public Health, and is exemplified in the course Tropical Public Health 203d, Problems in Tropical Health, open to all students. However, the student concentrating in the Department in preparation for a career in the field of international health

should, in addition to Departmental courses, acquire a broadened experience by elective work in other areas under the aegis of the Division of International Health.

The basic course, Microbiology and Tropical Public Health 201a,b is designed to provide students in the Master of Public Health program with newly-elaborated knowledge regarding major infectious diseases, and with the factual information concerning the epidemiology and control of selected entities of public health importance. Students concentrating in the Department will normally be expected to elect Microbiology and Tropical Public Health 202b, Tropical Public Health 203d, and Tropical Public Health 204c. Other advanced courses in Tropical Public Health are considered electives, to be selected on the basis of individual student interest and need.

The investigative program in the Department is broad and currently deals with pathogens ranging from viruses to helminths. Thus, studies on the *in vitro* cultivation and the physiology and immunology of a wide variety of agents are in progress. Biological investigations on the molluscan vectors of the schistosomes comprise another area of major interest. Facilities are available for the training of a limited number of students at the Doctor of Public Health or Doctor of Science level, who may wish to spend a minimum of two years with emphasis on a program of original research. Due to time limitations, the Doctor of Science applicant should, in so far as possible, obtain the necessary medical science background prior to enrollment.

A program supported by the National Institutes of Health is available to assist qualified applicants who desire training in medical parasitology and a similar program is available to provide training in tropical medicine. Collaborative arrangements established with institutions in the tropics provide diversified opportunities for study and research overseas.

Microbiology and Tropical Public Health 201a,b. Ecology and Epidemiology of Infectious Diseases

Lectures, seminars, and laboratory exercises. *Three one-hour sessions and one three-hour session each week, first period; one one-hour session and two two-hour sessions each week, second period.* Dr. Weller, Dr. Nichols and Staffs of the two Departments.

Credit 4 units.

This course is designed to provide an integrated presentation of information on communicable diseases of major public health importance. The exercises include discussions of the present status of infectious diseases in the developed and the developing areas of the world, and of procedures for their control from the community to the international level.

The course assumes a medical school background and an understanding of the pathogenesis of disease produced by bacteria, fungi, helminths, protozoa, rickettsiae, spirochetes and viruses. It is concerned primarily with

ecologic and other factors affecting transmission of these agents, with assessment of the public health significance of representative infectious diseases and with the increasing importance of the selection of methods for their prevention and control, particularly as regards the use of vaccines, chemotherapeutic agents, insecticides and other biologicals. In the laboratory exercises and demonstrations, the student is not expected to acquire technological skills, but rather an understanding of the potentialities and limitations of pertinent laboratory and field procedures.

Microbiology and Tropical Public Health 202b. Current Research in Infectious Diseases

Seminars. *One two-hour session each week, second period.* Dr. CHERNIN, Dr. VINSON and Staffs of the Departments of Microbiology and Tropical Public Health.

Credit 1 unit.

This course is required of all students concentrating in Microbiology or Tropical Public Health. Papers on topics of general interest are selected from current periodicals and critically reviewed as to soundness of experimental design, validity and significance of results and conclusions, organization of manuscripts and clarity of presentation.

Enrollment of nondepartmental students subject to approval of Instructor.

Tropical Public Health 203d. Problems in Tropical Health

Lectures and conferences. *One two-hour session each week, fourth period.* Dr. WELLER and Guest Lecturers.

Credit 1 unit.

This course is designed to provide general background information on environmental, social, economic, and political factors influencing the development of health programs in the tropics. At each session a distinguished guest lecturer covers an assigned topic; the subject material includes such diversified topics as the development of professional education in tropical areas, the important problems of agriculture, nutrition, and water supply, and the administrative and political backgrounds in the field of international technical cooperation. Each formal presentation is followed by a period devoted to informal student discussion. Enrollment is open to all students.

Tropical Public Health 204c. Public Health Aspects of Parasitic Diseases

Lectures, seminars, and laboratory exercises. *Two three-hour sessions each week, third period.* Dr. PAN, Dr. COOLIDGE and Staff of the Department.

Credit 2.5 units.

This course amplifies material presented in the basic course, and additionally provides coverage of significant parasitic entities not dealt with in Microbi-

ology-Tropical Public Health 201a,b. Concepts relevant to the investigation and control of parasitic diseases, such as quantitation of infection, are stressed. Selected examples of control programs will be examined. In the laboratory, the student will become familiar with techniques essential for the epidemiologic investigation of the important parasitic diseases of man.

Enrollment is limited and is subject to the approval of the Instructor.

Tropical Public Health 205c. Clinical and Pathologic Features of Tropical Diseases

Case presentations, clinico-pathologic conferences, and demonstrations. *One two-hour session each week, third period.* Dr. Weller, Dr. Morrow, Dr. Coolidge, Dr. von Lichtenberg and Staff of the Department.

Credit 1 unit.

This course, designed for students particularly interested in tropical medicine, supplements material presented in Microbiology-Tropical Public Health 201a,b. The emphasis is on the clinico-pathologic aspects of tropical diseases. At each session one or more disease entities are introduced by presentation of a clinical case and pertinent clinical and pathologic features of the disease are then reviewed.

Enrollment is subject to the approval of the Instructor.

Microbiology, Tropical Public Health and Epidemiology 206d. Tuberculosis

Seminars. *One two-hour session each week, fourth period.* Dr. Morrow, Dr. Mack, Dr. Berggren, and Dr. Campbell.

Credit 1 unit.

The purpose of this course is to provide an understanding of the ecology and the public health significance of tuberculosis. Emphasis is on tuberculosis control in the less-developed countries. Seminars focus on the microbiological, epidemiological, cultural, and economic factors which influence the form and effectiveness of tuberculosis control. Consideration is given to methods of analyzing the costs and benefits of national tuberculosis control programs.

Tropical Public Health 207d. Introduction to Molluscs of Public Health Importance

Conferences, laboratory and field exercises. *One three-hour session each week, fourth period.* Dr. Michelson.

Credit 2 units.

To be given in 1972–73, alternates yearly with Tropical Public Health 208d.

This is an introductory course designed to acquaint the student with the molluscs which may act either as active or passive agents for the dispersal of pathogens, toxins, or parasites which cause disease in man. Special emphasis is given to snails which serve as intermediate hosts of mammalian schistosomes.

Students are offered the opportunity to study field and laboratory techniques necessary for an understanding of the taxonomy, morphology, cultivation, ecology and control of these medically important molluscs.

Enrollment is subject to the approval of the Instructor.

Tropical Public Health 208d. Epidemiology and Control of Schistosomiasis

Seminars and laboratory exercises. *One three-hour session each week, fourth period.* Dr. MICHELSON, Dr. CHERNIN, Dr. PAN and Dr. WELLER.

Credit 2 units.

To be given in 1973–74, alternates yearly with Tropical Public Health 207d.

The problems posed by schistosomiasis as an expanding health hazard are presented in a series of seminars and laboratory exercises. Emphasis is given to the biology of snail vectors, to problems of assessment of significance of the disease, and to the potentials of various approaches to control. Opportunity to become familiar with appropriate techniques is afforded in the laboratory.

Enrollment is subject to the approval of the Instructor.

Tropical Public Health 209d. Introduction to Medical Entomology

Conferences, laboratory, and field exercises. *One three-hour session each week, fourth period.* Dr. SPIELMAN.

Credit 2 units.

To be given in 1973–74, alternates yearly with Tropical Public Health 210d.

This course deals with the insects, ticks, and mites of public health importance. The manner in which arthropods transmit disease and the principles of vector control are discussed from ecological, physiological and genetic points of view. Each conference presents an aspect of arthropod biology as it pertains to public health. Laboratory colonies of various vector species are maintained by the students to provide the basic material for study of life cycles and for arthropod identification. Laboratory and field exercises demonstrate entomological techniques currently employed by epidemiologists.

Enrollment is subject to the approval of the Instructor.

Tropical Public Health 210d. Current Problems in Malariology

Seminars and laboratory exercises. *One three-hour session each week, fourth period.* Dr. CHERNIN, Dr. SPIELMAN, Dr. WELLER and Staff of the Department.

Credit 2 units.

To be given in 1972–73; alternates yearly with Tropical Public Health 209d.

This course supplements the subject material on malaria offered in Microbiology-Tropical Public Health 201a,b and Tropical Public Health 204c. Particular attention is given to problems now encountered in eradication and

control programs. In the laboratory, experience is provided with procedures essential to the epidemiologic investigation of malaria.

Enrollment is subject to the approval of the Instructor.

Tropical Public Health 212c. Biomedical Writing

Seminars. *One two-hour session each week, third period.* Dr. CHERNIN.

Credit 1 unit.

Writing scientific papers is an integral part of the research process. This course is intended to develop practical skills and provide experience in planning and writing articles that meet the editorial demands of biomedical journals. The salient elements of a well-prepared article — logical organization, good scientific prose, and understandable tables and figures — will be emphasized by criticizing short papers written by the participants on biomedical subjects of their own choice.

Enrollment limited to ten students with advance approval of the Instructor.

Microbiology, Tropical Public Health and Epidemiology 214c,d. Case Studies in Epidemiology of Infectious Disease

Seminars and laboratory exercises. *One two-hour session each week, third and fourth periods.* Dr. MACK, Dr. MORROW, Dr. LANGMUIR and Dr. NICHOLS.

Credit 2.5 units.

This course is constructed to provide experience in solving epidemiologic problems in communicable and other disease situations. Epidemics of such disease entities as hepatitis, arbovirus infections, and smallpox are studied in seminars with emphasis on a commitment by the participants.

Tropical Public Health 300a,b,c,d,e. Tutorial Programs

Laboratory exercises. *Time and credit to be arranged.*

Individual work for candidates at the Master's degree level may be carried out under supervision of a member of the Department. A variety of parasites of medical importance are maintained and are available for studies on metabolism, host-parasite relationships, and chemotherapy. Arrangements are subject to the approval of the Instructor.

Tropical Public Health 350. Research

Doctoral candidates or qualified full-time special students may undertake original investigations in the laboratory or in the field by arrangement with the Head of the Department.

Members of the Department are currently engaged in the following areas of research:

351 Tissue culture, organ culture, and immunological techniques as applied to problems in medical virology (Dr. WELLER).

352 Cultivation *in vitro* of parasitic helminths, protozoa, and other invertebrates of medical importance (Dr. Weller, Dr. Chernin and Dr. Pan).

353 Biology, host-parasite relationships, and control of molluscan vectors of schistosomiasis and of other parasitic infections (Dr. Chernin, Dr. Michelson and Dr. Pan).

354 Population genetics, nutrition, and reproduction of medically important arthropods (Dr. Spielman).

355 Arthropod transmission of viral, protozoan, and helminthic agents (Dr. Spielman).

356 Etiology and epidemiology of mycobacterial diseases (Dr. Morrow).

FIVE

SPECIAL PROGRAMS

Programs in International Health

The School of Public Health has developed a Division of International Health. The primary objective of this Division is to utilize all departments and facilities of the School, as well as other related divisions of the University, to provide a comprehensive, effective, and efficient program of teaching, research, and service in all fields of international health.

The programs centered in the School, together with related course offerings in other divisions of Harvard University and the Massachusetts Institute of Technology, offer the student a broad background in preparation for future careers in the World Health Organization, the Agency for International Development of the U.S. State Department, the Department of Health, Education, and Welfare, the Peace Corps, the Armed Forces, industrial organizations, mission groups, philanthropic foundations, or with other governments and agencies providing varied careers in international health and in planning health services for developing countries.

The relevant course offerings are not concentrated in any one department of the School, since all departments have broad international interests in their respective fields. In addition to the requirements for the Master of Public Health degree, a varied selection of elective courses is available in the various Departments of the School in preparation for careers in international health.

Other divisions of Harvard University, namely the:

Medical School
Faculty of Arts and Sciences
Graduate School of Government
Center for Middle Eastern Studies
East Asian Research Center and
Development Advisory Service of the
Center for International Affairs

provide additional opportunities for study in medicine, economics, public administration, anthropology, government, social relations, language, and related subjects for students with special interests in particular regions of the world. Cross-registration opportunities for students interested in similar course offerings given by the Massachusetts Institute of Technology are also available. The various catalogues of these Faculties may be consulted for further details.

Programs of study may be selected leading to the Master of Public Health or Master of Science degree. Advanced students may be accepted as candidates for the Doctor of Public Health or Doctor of Science degree. A three-year residency program for physicians preparing for certification by the American Board of Preventive Medicine in the area of General Preventive Medicine (International Health) is also available to selected students.

Areas in which supervised field work or research may be undertaken will vary, depending on current opportunities afforded and the availability of qualified supervision. For example, under the sponsorship of the Department of Tropical Public Health, trainees have been engaged in studies on schistosomiasis in Nigeria and Brazil, on malaria in Gambia, and on nutritional anemias in Uganda. The Department of Nutrition has sponsored trainees in nutritional studies in Colombia. Other relationships have been or are in the process of being established with the Hôpital Albert Schweitzer in Haiti, Ministry of Health in the Bahamas, Puerto Rico, Jamaica, Brazil, Tunisia, Italy, Israel, Lebanon, Saudi Arabia, Nigeria, and in other developing areas of the world. Assignments to international agencies for work experience or research activities abroad are made only when the School is assured that competent local supervision and guidance are available.

Examples of current international research being conducted by the School include trachoma research in Saudi Arabia; effects of lysine enrichment of wheat and rice in Tunisia and Thailand; comparative heart disease studies in Ireland and U.S.; nutrition research in Colombia and Israel; population studies in Greece, United Arab Republic and India; typhus in Yugoslavia; research on urinary calculi in Thailand; cooperative cardiovascular disease investigation

in Japan; relative importance of hereditary environmental factors in cardiovascular disease in Israel; collaborative studies on cervical cancer, breast cancer and leukemia involving numerous countries; and comparisons of prevalence of chronic respiratory disease between the United States and the United Kingdom, and the United States and Japan.

The School has sponsored triennial meetings of the *Industrial Council for Tropical Health* since 1950. These conferences bring together guest experts, members of the Faculty, and medical and managerial personnel of corporations having interests in tropical regions for scientific and practical discussions of health problems. Through these conferences the School has established a wealth of international contacts which are of mutual benefit to industry, the School, its students, and alumni throughout the world.

International House, the School's residence for its graduate students and their families, both from the United States and abroad,

An International House Reception

provides an unusual opportunity for international contacts and extracurricular activities with professional health workers from a variety of countries. Some twenty-two to twenty-eight nations are represented in this group each year. Throughout the year there are opportunities for informal interchanges of ideas between students and their families. In addition, there are frequent discussions on topics of international interest, including presentations by international students on the culture, geography, social structure, and health problems of their home countries.

Finally, the Boston area as a whole provides a stimulating atmosphere for students interested in international affairs through such agencies as the local chapter of the Society for International Development, World Affairs Council, Pan American Society of New England, and many other agencies, programs and activities.

More current details on residency opportunities or other aspects of these programs may be obtained by addressing inquiries to Dr. Richard H. Daggy, Associate Dean for International Programs at the School.

Program in Occupational Medicine

The School offers to qualified applicants the two years of academic training requisite to certification in Occupational Medicine. Physicians may enroll in this program through any of the master's degree programs offered by the School. Physicians planning an academic or research career may be accepted for work toward a doctoral degree in occupational medicine or environmental health. Other students may elect a second year of formal courses and tutorial study in occupational medicine and public health. The usual course content of the first-year program is listed under the Master of Industrial Health degree. Additional courses and course content may be found under the departmental listings. In addition, as in other programs of the School, it is possible to cross-register with other Harvard faculties and with Massachusetts Institute of Technology to pursue special interests.

Clinical experience is offered in certain of the Harvard-affiliated hospitals where both occupational and non-occupational disease can be seen. Further experience is obtained through the University Health Services at Harvard (approved for third year, in-plant residency) and the Occupational Medical Services at Massachusetts Institute of Technology. Experience in an industrial medical department can be arranged during the summer months in selected local industries to supplement the academic training.

Financial support is available from Federal grants to the School. United States citizenship or permanent residency status is required for these fellowships. For more detailed information on various aspects of the Program address inquiries to Dr. James L. Whittenberger, Professor and Head, Department of Physiology, Harvard School of Public Health.

Interfaculty Program on Health and Medical Care

The Interfaculty Program on Health and Medical Care is a cooperative undertaking of the Schools of Public Health, Medicine, Government, Business Administration, and the Department of Economics in the Faculty of Arts and Sciences. Its major purpose is to provide advanced programs in the economics and administration of medical care at both the master's degree and doctoral levels for personnel in the various relevant disciplines.

The Program is intended to equip the student for administrative and policy-making posts in medical care programs or for related teaching and research positions. The Program is planned for several types of students: (1) for those whose needs are met by a a master's degree program at the School of Public Health or School of Government, (2) for students who wish to specialize more intensively in medical care during a two year-period, (3) for doctoral candidates under the guidance of any of the participating faculties, and (4) for physicians participating in the residency program in General Preventive Medicine (Health Services Administration) in the School of Public Health.

The Program offers training and research experience in the provision of medical care services and stresses the study and analysis of varying patterns of organization, delivery, and financing of personal health services in the United States and other countries. Students include physicians and other health professionals, economists, social scientists, and management analysts. They are from the various participating schools and departments within Harvard University, and are enrolled as master or doctoral degree candidates in their own schools and departments while taking the Program's basic courses.

A wide range of elective courses is available, in addition to those offered by the School of Public Health, through the various faculties concerned and from the Massachusetts Institute of Technology.

The objective with students enrolled in the School of Public Health is to instruct them in analysis and decision-making and to give them an appreciation of the application of the administrative and social sciences in the operation of medical care programs. For students from other than the School of Public Health, the Program's objective is to provide an adequate understanding of medical care and the special attributes of organized forms of medical care services and to encourage the intelligent application of their own specialties to analysis, planning, evaluation, and research in the field of personal health services.

The Program's research studies provide opportunities for exceptional students to undertake doctoral work and to gain substantial research experience.

For more detailed information on various aspects of the Program, including support for physician residency training, address inquiries to Dr. Alonzo S. Yerby, Professor of Health Services Administration and Director of the Interfaculty Program on Health and Medical Care.

Postdoctoral Fellowship Program in Dental Public Health

The School of Dental Medicine in cooperation with the School of Public Health and the Massachusetts Department of Public Health offers a three-year program of postdoctoral study intended to prepare a limited number of individuals for creative full-time careers in dental public health and dental ecology. Each person accepted into the program will be appointed as a Research Fellow in Dental Ecology at the School of Dental Medicine.

The first year of the program is spent at the School of Public Health as a candidate for the degree of Master of Public Health. Graduates of other such schools, however, may be accepted into the program with one year advanced standing. The second year involves residency training in cooperation with the Massachusetts Department of Public Health to meet the requirements of the American Board of Dental Public Health. The third year affords opportunity for advanced didactic work and research at the School of Dental Medicine, the School of Public Health and/or other institutions. A research thesis is prepared in this year. A three-year postdoctoral fellowship certificate is awarded upon completion.

The program is designed to meet the needs of the particular student. Academic study beyond the master's level may be arranged in other departments of the University. Residency training involves responsible work with the Massachusetts Department of Public Health at the state or community level. Epidemiological or other research work can be carried on over the entire three-year period in a variety of situations involving either new or continuing studies.

For further information and application forms, write to Donald B. Giddon D.M.D., Ph.D., Professor of Dental Ecology, Harvard School of Dental Medicine, 188 Longwood Avenue, Boston, Massachusetts, 02115.

Special Courses in Preparation for Careers in Teaching

The role of community-oriented instruction in medical education has, in recent years, been receiving increasing recognition. Major changes are taking place in the teaching of public health and preventive medicine, both in the United States and abroad. The challenge of expanding teaching responsibilities has led to a growing need for qualified teachers of public health, preventive medicine, and preventive dentistry in schools of public health, medicine and dentistry as well as in community-based health programs.

The interest of the Harvard School of Public Health in preparing students for teaching posts both within the United States and abroad is underscored by the fact that approximately 60% of our students plan to teach on a full-time basis following graduation from the School. In many instances such alumni prepared for their teaching and research careers by completing the program for the degree of Doctor of Public Health or Doctor of Science in their chosen academic specialties. Although the curriculum has emphasized didactic instruction in a particular academic discipline as well as training in research methodology, there has, however, been a need for special courses in teaching methods to supplement the various programs of the twelve departments of the School.

The special courses in teaching methods which were developed during 1961–1965 have been continued and further modified. Their major goals are:

1. To develop competence in the formulation of education policy in the field of community medicine and public health.
2. To introduce students to modern educational methods and media and enable them to utilize specific methods to implement their own instructional objectives.
3. To help students to develop patterns of self-education through

which they may continue to increase their competence in teaching after completion of the program.

These courses may be taken as part of a program leading to either a Master of Public Health or Master of Science degree.

The objectives of the special courses are carried out by supplementing the existing departmental course structure by means of special seminars, workshops, and tutorial instruction offered by senior members of the Faculty. Participants include Faculty from Harvard Graduate School of Education and from other Harvard Schools as well as specialists in medical education from departments of community medical education from this country and abroad. The basic course on Educational Methods provides an overview of current educational theory and methodology in terms of the relevance to public health teaching. This includes principles of curriculum development, formulation of educational objectives, selection of teaching methods, and forms of evaluation. A final section of the course gives students an opportunity to study educational methods in depth.

Five seminars on educational policy are offered which orient students to special problems and issues associated with teaching community medicine and public health. The various approaches to teaching are considered in historical and geographical perspective and in relation to the changing goals of education in the health sciences.

Further information on the special courses may be obtained by addressing inquiries to Dr. Ascher J. Segall, Associate Professor of Epidemiology.

Residency Programs

The School offers approved residency training leading to certification by the American Board of Preventive Medicine in the following areas:

General Preventive Medicine, in the specialty areas of
- Epidemiology
- International Health
- Health Services Administration

Occupational Medicine

Aerospace Medicine

Residency programs are three years in length and consist of one or two years of study leading to the graduate degree, Master of Public Health, or Master of Science, and one or two years of more advanced work including supervised experience which may or may not be part of a doctoral program. The third year may be devoted to training in an approved industry, organization, or institution consistent with the specialty area.

Further details on the residency programs, including availability of financial support, can be obtained through the Director of Admissions.

Combined Degree Programs with Harvard Medical and Dental Schools

In response to trends in medical school curricula and increasing interest of medical students in community medicine and public health, the School offers admission to the Master of Public Health or Master of Sciences programs as part of a combined degree program. The medical or dental student admitted to this program can satisfy requirements for a public health degree within the four years usually required for the Doctor of Medicine or Doctor of Dental Medicine degree. Students from medical schools other than Harvard normally enroll full time for an academic year, after completion of at least two years of medical school. Harvard students are eligible for consideration after admission to the Medical School or Dental School. Such students usually enroll full time for the Fall Term of their third year and complete requirements for a public health degree either by enrolling full time in the Spring Term or by spreading their electives in public health over a longer period.

SIX

GENERAL INFORMATION

Registration

Registration in the School of Public Health for the academic year 1972–73 will be held on the following dates:

September 11, Monday, 10 A.M.	Opening session and registration for new International Students
September 13, Wednesday, 2 P.M.	Opening session and registration for new U.S. Students
September 18, Monday, 10 A.M.	Opening session and registration for students enrolled in 1971–72

The period between the opening sessions and September 20 will be devoted to orientation lectures, individual conferences with Faculty members, and selection of courses of study. All students are required to attend the opening session and to be present for the registration period.

International Students

A program of lectures and discussions during the period from Monday, September 11 through Tuesday, September 19, 1972, is planned to acquaint the students with our customs and teaching methods, with library and other facilities available. It includes visits to various University departments and to hospitals or public health activities in Boston.

During this period each student who comes from outside the United States will have a conference with the Associate Dean for International Programs to discuss his particular needs and interests. The Associate Dean, as well as the staff of the Dean's Office, is available for consultation with students throughout the year.

All students who are not citizens of the United States are referred during the orientation period to the Harvard International Office, Holyoke Center, 75 Mt. Auburn Street, Cambridge, where they show their passports and fill out a Student Registration form.

Fees and Expenses

The tuition fees for the academic year 1972–73 are listed below. The fee includes the Health Service Fee for medical care and hospital insurance for all resident students. Each candidate for a degree must have a minimum of one year of residence at the School at full tuition.

	1972–73
Full-time resident students	$3,000
Half-time resident students	1,725

All students will pay tuition at the above rates with the following exceptions:

Doctoral candidates or Special Students in the second or later years of a doctoral or special program:

Full-time resident students	1,725
Half-time resident students	925
Non-resident doctoral candidates, registered in absentia	200

Part-time Special Students, enrolled for less than half-time:

First credit unit of work	135
Each additional unit per term up to 10 units	70

Summer Session — Effective July 1, 1973

Students who register and receive credit for research or supervised study during the 12-week summer period $450

Students registered for less than 12 weeks will pay at a proportionate rate.

Payment of Fees

Bills for tuition and fees will be issued and payable as follows:

Issued	*Payable*	
At registration	Within 10 days	¼ Tuition
Nov. 30	Dec. 15	¼ Tuition Miscellaneous Charges
Jan. 30	Feb. 15	¼ Tuition Miscellaneous Charges
April 30	May 15	¼ Tuition Miscellaneous Charges
June 3*	June 10	Miscellaneous Charges
June 30	July 15	Miscellaneous Charges

Students who are candidates for degrees must have paid all dues to the University at least one day before the day upon which the

* Applies only to candidates for degrees.

degrees are to be voted. A student who leaves during the year is charged to the end of the tuition period in which he leaves, provided before that time he gives the Dean notice in writing of his withdrawal; otherwise he is charged to the end of the tuition period in which such notice is given.

A student who leaves the University for any reason whatever must pay all charges against him immediately upon receipt of a bill from the Comptroller's Office. Every student is held responsible for the payment of fees until he has notified the Dean of his intention to withdraw from the School.

All term bills are sent to the student at his local address unless the Comptroller's Office is requested in writing to send them elsewhere.

Any student whose indebtedness to the University remains unpaid on the date fixed for payment is deprived of the privileges of the University. Reinstatement is obtained only by consent of the Dean of the School in which the student is enrolled after payment of all indebtedness and a reinstatement fee of $10. In addition as a condition of reinstatement such student is required to file with the Comptroller a bond in the amount of $1000 as security for the payment of future term bills.

Field Observation Study Visit

The estimated cost of travel, hotel accommodations, and food for the one-week study period in Puerto Rico (Maternal and Child Health 330e) is $300. Each student wishing to enroll in either course should assure himself that the necessary funds to cover this expense are available from his fellowship or other sources.

Student Health Service

Under the University Health and Insurance Plan, students at the School of Public Health receive medical care and insurance toward hospital expenses. Medical care is provided through the facilities of the Medical Area Health Service, located in Vanderbilt Hall. The hospitalization insurance extends for a period of twelve months from September 1, and covers hospitalization in Boston and elsewhere. Research and Teaching Fellows who are in a training status are required to enroll in the Student Health Plan unless they can show that they have comparable coverage.

A prepaid program for the care of wives (including Maternity Benefits) and children of full-time students is available. As the plan provides extensive benefits for ambulatory and inpatient care, all who are eligible are strongly advised to enroll. Its coverage, like that of the Student Plan, extends for a period of twelve months from September 1, and provides full semi-private hospitalization benefits. Information about the plan for dependents is sent to students in advance of registration or may be obtained from the Registrar.

Successful vaccination for smallpox within the previous three years is required of all students entering any of the schools of the University if the student comes directly from any area of the world where smallpox is currently endemic. A certification form for this purpose is sent to each student who is accepted for admission. The form is to be completed and returned *only* if the student comes directly from an endemic area.

Any illness necessitating absence from classes should be reported to the Medical Area Health Service Office by the student or an attending physician, and to the Registrar's Office at the School. A physician from the Medical Area Health Service is on call twenty-four hours a day and can be reached through the switchboard of Harvard University.

Housing

The Henry Lee Shattuck International House is an apartment residence operated on a nonprofit basis by the Harvard School of Public Health for its full-time students and their families. The sixty-one furnished apartments are leased on a ten-month basis for the period September 1 through June 30 rather than the customary twelve months. Special arrangements can be made for summer rentals in July and August.

Henry Lee Shattuck International House

Residents enjoy a wide selection for browsing, reading and borrowing in the International House library.

The children have their own playroom indoors and a playground outside.

The necessary application forms and additional information regarding the House may be obtained by writing to:

Mrs. Margaret D. Penrose
Director, Shattuck International House
Harvard School of Public Health
55 Shattuck Street
Boston, Massachusetts 02115

The deadline for submitting applications is May 1. However, late applications will be accepted as long as space is available.

In general, housing in Boston is expensive and adequately furnished apartments are limited. Additional information on housing may be obtained from the Harvard University Housing Office, 1737 Cambridge Street, Cambridge, Mass. 02138.

Fellowships, Traineeships and Scholarships

Most students in training for a career in public health are able to obtain financial assistance, in some cases adequate to meet the costs of living in Boston. The applicant should be aware, however, of the many restrictions on the availability of such funds. Most of the funds for financial aid are available through grants from the federal government, and eligibility for these requires U.S. citizenship or equivalent status. Almost without exception, students must be enrolled on a full-time basis and be candidates for degrees. A very small amount of money is available on a scholarship basis from University funds; *this is sufficient for only one or two awards per year.*

Detailed information can be obtained by writing to the Director of Admissions, Harvard School of Public Health, 55 Shattuck Street, Boston, Massachusetts 02115.

Students 1971-72

Degree Candidates and Full-time Students

Robert Ackerman, A.B., M.D.	Cambridge, Massachusetts
Josie I. A. Adetosoye, L.R.C.P., M.R.C.S., D.T.M. & H., D.P.H.	Ondo, Nigeria
Tullio F. Albertini, S.B., D.D.S.	Natick, Massachusetts
George J. Annas, A.B., J.D.	St. Cloud, Minnesota
William B. Applegate, A.B.	Bardstown, Kentucky
Jaime Arias, M.D.	Bogota, Colombia
Stephen S. Arnon, A.B.	Kensington, California
John E. Arradondo, A.B., M.D.	Altus, Oklahoma
Ralph D. Aserkoff, A.B., M.D.	Chestnut Hill, Massachusetts
Lynn Margaret Ausman, S.B., S.M. IN HYG.	Monterey, California
John H. Austin, S.B., M.D.	Boulder, Utah
Claire Baldwin, A.B., S.M.	Brookline, Massachusetts
Joan Barenfanger, S.B., S.M. IN MICRO.	Salem, Illinois
Beth Stacy Barrett, A.B.	East Meadow, New York
Thomas J. Bauer, S.B., S.M.	St. Petersburg, Florida
David W. Bearg, S.B.	Boston, Massachusetts
J. Walter Beck, S.B., S.M., PH.D.	Miami, Florida
Gary M. Benke, A.B., S.M.	Belvidere, New Jersey
Elaine Carol Berlinsky, A.B.	Providence, Rhode Island
Frank J. Bia, S.B., M.D.	Bronx, New York
Joseph Boffa, A.B., D.D.S.	Brockport, New York
*Vicente R. Borrero, M.D., M.P.H., S.M. IN HYG.	Cali, Colombia
Markley H. Boyer, A.B., M.D., PH.D.	Lincoln, Massachusetts
Joseph Braverman, A.B., M.D.	Newton Center, Massachusetts
Sidney Brodie, A.B., M.D.	Chestnut Hill, Massachusetts
Otto A. Brusis, M.D., M.P.H.	Brookline, Massachusetts
H. J. Leslie Burgess, M.B.B.CH., D.T.M. & H., D.P.H.	Maidstone, Kent, England
Milton E. Burglass, A.B., S.M., M.D.	New York, New York
Joseph Anthony Burke, S.B., M.D.	Worcester, Massachusetts
Kenneth P. Cantor, A.B., PH.D.	Cambridge, Massachusetts
Valentin P. Cassan, M.D.V., M.P.H.	Neuilly, France
Gennaro L. Cataldo, S.B., D.M.D.	Revere, Massachusetts
Peter T. Choras, B.SC., M.D.	Weston, Massachusetts
Mary E. Coffey, S.B., S.M.	Cambridge, Massachusetts

*Joel E. Cohen, A.B., A.M., PH.D., M.P.H.	Cambridge, Massachusetts
Sr. Martha Collins, M.B.B.CH., D.C.H.	Lexington, Massachusetts
Joyce E. Corey, A.B.	Sharon, Massachusetts
James E. Dalen, S.B., A.M., M.D.	Chestnut Hill, Massachusetts
Lawrence J. D'Angelo, A.B.	Southington, Connecticut
Andrew Griswold Dean, A.B., M.D.	Fairport, New York
Gordon L. Deane, A.B.	Everett, Massachusetts
Dustin L. Decker, A.B., A.M.	Lexington, Massachusetts
Arthur E. Desrosiers, S.B., S.M.	Fall River, Massachusetts
Eric R. DeWinter, M.D.	Aerdenhout, Holland
Kalyanmani A. Dixit, M.B.B.S.	Kathmandu, Nepal
Modupe A. Doherty-Akinkugbe, B.A., M.B.B.CH.	Lagos, Nigeria
Richard K. Donelson, M.D., M.P.H.	Sacramento, California
James E. Drorbaugh, A.B., M.D.	Brookline, Massachusetts
Karin A. Dumbaugh, A.M.	Boston, Massachusetts
Bruce A. Egan, A.B., S.M., S.M. IN HYG.	Newton, Massachusetts
Philip S. Eichling, A.B., M.TH., M.D.	Boston, Massachusetts
Frank A. Eke, M.B.B.S.	Portharcourt, Nigeria
Salah A. El-Eteky, P.N.S., M.B.B.CH.	Kuwait City, Kuwait
Edward M. Elkin, A.B., M.D.	Newburyport, Massachusetts
Arthur J. Epstein, A.B.	Baraboo, Wisconsin
Connie Joann Evashwick, A.B., A.M., S.M. IN H.S.AD.	Long Beach, California
Fred M. Feinsod, S.B.	Roslyn, New York
John B. Feldman, S.B., S.M.	Newton, Massachusetts
James D. Felsen, M.D.	Brookline, Massachusetts
Lawrence J. Fine, S.B., S.M., M.D.	Brookline, Massachusetts
Sheldon A. Fishman, S.B., S.M.	Newton, Massachusetts
Daniel F. Flynn, A.B.	Waltham, Massachusetts
Thomas O. Frostman, S.B., S.M.	Wausau, Wisconsin
James M. Galvin, S.B. S.M., S.M. IN ENV. H.	Brookline, Massachusetts
Mehari Gebre-Medhin, B.M.,M.D.	Addis Ababa, Ethiopia
Stanley A. Gering, A.B., M.D.	Allston, Massachusetts
Roger I. M. Glass, A.B.	Somerville, New Jersey
*Judith D. Goldberg, A.B., S.M. IN HYG.	New York, New York
Michael D. Goldman, A.B., M.D., S.M. IN HYG.	Wayland, Massachusetts
Louise B. Goldsmith, A.B., M.P.A., S.M. IN HYG.	Boston, Massachusetts
*Donald E. Goldstone, A.B., M.D., M.P.H.	Baltimore, Maryland
Robert G. Gould, A.B., S.M.	Bryden, New York
Larry L. Grabhorn, S.B., M.D.	Indianapolis, Indiana

Leslie J. Graitcer, A.B., ED. M.	Lansdowne, Pennsylvania
Philip L. Graitcer, A.B., D.D.S.	Lansdowne, Pennsylvania
*Peter Greenwald, A.B., M.D., M.P.H.	Albany, New York
Barbara A. Grossman, A.B., M.A.T., S.M. IN HYG.	Cambridge, Massachusetts
William Gurnack, A.B., M.D.	Columbia, Connecticut
*Jean-Pierre Habicht, M.D., M.P.H.	Geneva, Switzerland
*Douglas I. Hammer, S.B., M.D., M.P.H.	South Orange, New Jersey
Laurel S. Harken, S.B., M.D.	Jamaica Plain, Massachusetts
*Andrew C. Harper, M.B.B.S., M.P.H.	New South Wales, Australia
Natalie A. Harris, A.B., A.M.	Rego Park, New York
*Stuart C. Hartz, B.BA., S.M.	Boston, Massachusetts
Ann Hathaway, A.B.	Concord, New Hampshire
Harold B. Hawkins, A.B., B.M.S., M.D.	Brookline, Massachusetts
Frederick L. Hayden, B.M.S.	Manchester, New Hampshire
Charles W. Hays, A.B., M.D., M.P.H.	Springfield, Missouri
Richard D. Heimbach, A.B., S.B., M.D., PH.D.	Stamford, Connecticut
Charles H. Hennekens, Jr., S.B., M.D.	Hollywood, Florida
John A. Hennen, A.B., A.M., PH.D.	Brookline, Massachusetts
Allen J. Herbert, S.B., M.D.	Ruston, Louisiana
Barbara R. Herrmann, S.B., S.M.	Cambridge, Massachusetts
William C. Hinds, B.M.E., S.M. IN HYG.	Cambridge, Massachusetts
Rodney Hoff, S.B., M.P.H.	Brownsville, Wisconsin
Ralph G. Holt, A.B., S.B., M.D.	Brookline, Massachusetts
Robert N. Hoover, A.B., M.D., S.M. IN HYG.	Boston, Massachusetts
Jerry R. Hordinsky, M.D.	Drake, North Dakota
James T. Howell, S.B., M.D.	Palm Springs, Florida
Belle Huang, A.B.	Boston, Massachusetts
Elaine Mu-Pin Hui, S.B.	Hong Kong, China
John E. Jacobson, A.B.	Cheyenne, Wyoming
Lawrence J. Jenkins, Jr., A.B., S.M. IN PHYS.	Sikeston, Missouri
Matthew L. Kakande, M.B.B.CH., D.T.M. & H., D.P.H.	Kampala, Uganda
Give Kamali, S.B., S.M.	Tehran, Iran
Paula H. Kanarek, S.B., S.M. IN HYG.	Oak Park, Michigan
Martin J. Kandes, S.B., M.P.H.	Daisytown, Pennsylvania
Michael L. Kaplan, S.B., D.V.M., S.M. IN HYG.	Marblehead, Massachusetts
*Samuel D. Kaplan, A.B., M.D., S.M. IN HYG.	Port Jervis, New York
Norma A. Kaplis, S.B., D.D.S.	Adelphi, Maryland
Joel Kavet, S.B., M.P.H.	Brookline, Massachusetts
Robert I. Kavet, S.B., M.E.E.	Lexington, Massachusetts
C. William Keck, A.B., M.D.	Cleveland, Ohio
*Ralph L. Kent, Jr., A.B., S.M. IN HYG.	Dedham, Massachusetts

Howard S. King, A.B., M.D.	Waban, Massachusetts
Ronald M. Klar, A.B., M.D.	Cambridge, Massachusetts
Grace B. Kleinbach, A.B., M.D., M.P.H.	Boston, Massachusetts
Peter J. Knapp, S.B., S.M. IN HYG.	Arlington, Massachusetts
Harry B. Knaster, A.B., M.D.	Jamaica Plain, Massachusetts
James P. Kornberg, S.B., S.M.	University City, Missouri
Oluwole E. K. Kuteyi, M.B.B.CH.	Ondo, Nigeria
Rice C. Leach, A.B., M.D.	Louisville, Kentucky
Aaron Lechtig, M.D.	Guatemala City, Guatemala
J. Stauffer Lehman, Jr., A.B., M.D.	Ocean City, New Jersey
John B. Levine, A.B.	Lowell, Massachusetts
Richard Carl Levy, A.B., M.D.	Irvine, Kentucky
Matthew H. Liang, A.B., B.M.S., M.D.	Cambridge, Massachusetts
William V. Lipton, A.B., S.M., S.M. IN ENV. H.	Jamaica Plain, Massachusetts
Paibool Lohsoonthorn, M.D., M.P.H.	Bangkok, Thailand
*Stephen K. Lwanga, B.A., M.SC.	Kampala, Uganda
Cornelia Mack, A.B., S.M.	Cambridge, Massachusetts
Alexander E. MacLeod, B.D.S., D.D.S., M.A., S.M. IN BEH. S.	Halifax, Nova Scotia
Morton A. Madoff, A.B., M.D.	Lexington, Massachusetts
Anastasia Makris, A.B., S.M., S.M. IN HYG.	Bristol, Connecticut
Therese Malcolm, A.B., A.M.	Natick, Massachusetts
Eugene F. Mallove, S.B., S.M.	Waltham, Massachusetts
Robert R. Maronpot, S.B., D.V.M., S.M.	North Dartmouth, Massachusetts
John S. Marr, A.B., M.D.	Cambridge, Massachusetts
Wendy K. Marson, B.SC.N., M.P.A.	Vancouver, British Columbia
Mary Anne Matthews, A.B.	Brighton, Massachusetts
Alnita Trawick McClure, S.B., M.S.W.	Boston, Massachusetts
James J. McCormack, A.B., M.S.W., PH.D.	Holliston, Massachusetts
*E. Noel McIntosh, S.B., M.D., S.M. IN HYG.	David City, Nebraska
Alexander J. McLean, B.E., M.E., S.M. IN HYG.	Cambridge, Massachusetts
Francis Joseph Mecler, S.B.	Baltimore, Maryland
Susanne Menzel, M.D.	Goettinger, Germany
Marilyn B. Metz, A.B.	Cambridge, Massachusetts
Augustine E. Moffitt, A.B., S.M. IN HYG.	Woburn, Massachusetts
Brian V. Mokler, A.B., S.M., S.M. IN HYG.	Brookline, Massachusetts
Hyung Ro Moon, M.D., S.M., PH.D.	Seoul, Korea
*Alan S. Morrison, A.B., M.D., S.M. IN HYG.	Brookline, Massachusetts
Kenneth E. Mott, S.B., M.D.	Cambridge, Massachusetts
Donald M. Muirhead, Jr., A.B., M.D.	Wellesley, Massachusetts

Michael D. Murphy, M.B.B.CH., L.R.C.P., M.R.C.S., M.P.H.	Boston, Massachusetts
Nirmala S. Murthy, B.A., M.A., S.M. IN POPL.	Bombay, India
Kenneth K. Nakano, A.B., M.D., M.P.H.	Boston, Massachusetts
*Raymond K. Neff, A.B., S.M. IN HYG.	Cambridge, Massachusetts
Joyce A. Nettleton, B.H.SC., M.N.S.	Barrie, Ontario, Canada
Elinor T. Neuhauser, A.B., M.D.	Brookline, Massachusetts
*Raymond R. Neutra, A.B., M.D., M.P.H.	Los Angeles, California
Eli H. Newberger, A.B., M.D.	Boston, Massachusetts
Donald Tracy Oakley, S.B., S.M.	Rockville, Maryland
Frederick B. Oleson, Jr., A.B.	Concord, Massachusetts
Nosakhare Omoregie, M.B., M.B.B.CH., M.D.	Benin City, Nigeria
Robin Denise Orr, S.M.	Lexington, Massachusetts
Jennie Ann Ozog, S.B.	Albuquerque, New Mexico
Megh B. Parajuli, M.B.B.S.	Kathmandu, Nepal
Lawrence J. Partridge, Jr., S.B., S.M.	Pittsfield, Massachusetts
Robert M. Patterson, A.B., S.M. IN HYG.	Aiken, South Carolina
Walter L. Pelham, S.B., M.D.	Delman, New York
Susan Perrine, A.B.	Dhahran, Saudi Arabia
Bruce W. Pfeffer, A.B., M.D.	Altoona, Pennsylvania
Joffie C. Pittman, A.B., D.D.S.	Silver Spring, Maryland
Harrison G. Pope, Jr., A.B.	Wiscasset, Maine
Horacio J. Puga-Mendhilaharzu, M.P.H., M.D.	Tucuman, Argentina
Frank C. Ramsey, M.B.B.S., M.R.C.S., L.R.C.P., M.R.C.P., D.C.H.	Barbados, West Indies
Ann S. Randtke, A.B., S.M. IN PHYS.	Rochester, New York
Kakaraparti V. Rao, A.B., A.M.	Hyderabad–1, India
Mark S. Rapoport, A.B., M.D.	Great Neck, New York
Donald S. Ratney, S.B., S.M., PH.D.	Bedford, Massachusetts
Anthony E. Raynes, B.SC., M.B.B.S., M.R.C.S., L.R.C.P.	Cambridge, Massachusetts
Joseph A. Rhyne III, A.B., M.D.	Millis, Massachusetts
Judy D. Ribaya, S.B., S.M.	Quezon City, Philippines
Rudy J. Richardson, S.B., S.M.	Boston, Massachusetts
James McD. Robertson, D.V.M., M.SC., (MED.)	Ontario, Canada
*Jean A. Rochon, B.A., LL.L., M.D., M.P.H.	Montreal, Canada
*Edward J. Rolde, A.B., M.D., S.M. IN HYG.	Weston, Massachusetts
Peter M. Roncetti, S.B.	Teaticket, Massachusetts
Lynn A. Rosenberg, A.B., A.M.	Brookline, Massachusetts
Loren H. Roth, A.B., M.D.	Boston, Massachusetts
Kenneth J. Rothman, A.B., D.M.D., M.P.H.	Boston, Massachusetts

Stephen N. Rudnick, S.B., S.M., S.M. IN HYG.	Wethersfield, Connecticut
Fred G. Rueter, S.B., S.M.	Gaithersburg, Maryland
Antonio Ruffino-Netto, M.D.	Sao Paolo, Brazil
George M. Ryan, Jr., S.B., M.D.	Brookline, Massachusetts
*Richard Ryan, Jr., A.B., M.S.S.S., S.M. IN HYG.	Boston, Massachusetts
Elliot I. Salenger, A.B., M.D.	Hollis Hills, New York
Leslie D. Schlessinger, A.B.	Chicago, Illinois
Margo W. Schuster, M.N.S., S.B.	Albuquerque, New Mexico
Odile M. Seeley, B.SC.	Somerville, Massachusetts
Andrew L. Selig, A.B., M.S.W., S.M. IN HYG.	Denver, Colorado
Satyakam Sen, B.A., M.A., PH.D.	Framingham, Massachusetts
Warren Sewall, S.B., M.D.	West Hartford, Connecticut
Samuel Shapiro, M.B.B.CH., M.R.C.P., M.R.C.P.E.	Boston, Massachusetts
Rudra M. Shrestha, B.SC., M.B.B.S.	Kathmandu, Nepal
Ralph E. Shuping, A.B., S.M.	Norwood, Massachusetts
Reinhard Sidor, A.B., S.M. IN HYG.	Newton Highlands, Mass.
Susan D. Singleton, A.B.	Wakefield, Massachusetts
Douglas G. Smith, A.B., S.M. IN HYG.	Lancaster, Pennsylvania
Lee E. Smith, Jr., S.B., S.M.	Scottsbluff, Nebraska
M. Geoffrey Smith, A.B., M.D.	Winooski, Vermont
Jeffrey L. Speller, A.B.	Philadelphia, Pennsylvania
Cynthia M. Stevens, A.B., D.D.S.	Evanston, Illinois
Kavi Suvarnakich, M.D.	Bangkok, Thailand
Ira B. Tager, A.B., M.D.	Norwood, Massachusetts
Kenneth J. Tardiff, M.D.	Boston, Massachusetts
Margaret Terzaghi, A.B., A.M.	Winchester, Massachusetts
Gilles P. Theriault, B.A., L.M.C.C., M.D., M.I.H.	Cap do la Madelaine, Quebec, Canada
Bruce J. Thompson, A.B., M.S.W.	Boston, Massachusetts
Sumner E. Thompson III, S.B., M.D.	Westwood, Massachusetts
Hugh H. Tilson, A.B., M.D., M.P.H.	Vancouver, Washington
Edmund Y. S. Tong, S.B., D.D.S.	Brookline, Massachusetts
Helena A. Trindade, B.SC.	Rio De Janeiro, Brazil
H. Marcelo Trucco, M.D.	Santiago, Chile
Nicole D. Urban, A.B.	Trenton, New Jersey
Alexander M. Walker, A.B.	San Francisco, California
Ronald Alan Walter, S.B., S.M.	Cambridge, Massachusetts
James H. Warram, S.B., M.D., S.M. IN HYG.	Brookline, Massachusetts
David H. Wegman, A.B., M.D.	Cambridge, Massachusetts

Roland L. Weinsier, S.B., M.D., M.P.H.	Boston, Massachusetts
Chi-Pang Wen, M.D., M.P.H.	Taiwan, China
Walter Churchill Willett, M.D.	Okemos, Michigan
Jerry R. Williams, A.B., B.SC., M.SC.	Boston, Massachusetts
Stephen J. Williams, S.B., S.M.	Bethesda, Maryland
Winnie O. Willis, A.B., ED.M.	Pleasantville, New Jersey
John R. Wilson, A.B.	Palo Alto, California
Kenneth Richard Wing, A.B., J.D.	Sunnyvale, California
Ray C. Woodcock, A.B., S.M. IN ENV.H.	Harrisonville, Pennsylvania
Francisco J. Yepes, B.SC., M.D., M.P.H., S.M. IN H.S.AD.	Bogota, Colombia
Martha H. Zaidenberg, S.M.	Parana' (Entre Rios), Argentina

Part-time Special Students

John D. Boice, Jr., S.B., S.M.	El Paso, Texas
William M. Carleton, A.B., M.D.	Sudbury, Massachusetts
Jeffrey A. Cutler, A.B., M.D., M.P.H.	Framingham, Massachusetts
Alfred G. Divenuti, A.B., M.B.A.	Stoneham, Massachusetts
Carolyn J. Dorner, A.B., M.A.T., M.D.	Lexington, Massachusetts
Joan F. Grindley, S.B.N., S.M.N.	Dorchester, Massachusetts
Michael H. Gustin, S.B.	Willowdale, Ontario, Canada
Barbara D. Pulaske, S.B., A.M.	Clinton, Massachusetts
Annie Sulahian, M.SC., PH.D.	Beirut, Lebanon

* In Absentia

SUMMARY

Candidates for the degree of Master of Public Health	80
Candidates for the degree of Master of Science	72
Candidate for the degree of Master of Industrial Health	1
Candidates for the degree of Doctor of Public Health	16
Candidates for the degree of Doctor of Science	55
Full-time Special Student	1
Part-time Special Students	6
MD–MPH Candidates	12
MD–SM Candidate	1
	244

GEOGRAPHICAL ORIGINS OF STUDENTS

United States	190
Canada	7
South America	10
Europe	10
Asia	13
Africa	10
Australia	3
West Indies	1
	244

Degrees

On June 17, 1971, the following degrees were conferred:

DOCTOR OF PUBLIC HEALTH

Noel Scott Weiss, A.B. (*Stanford Univ.*) 1965, M.D. (*ibid.*) 1967, M.P.H. (*Harvard Univ.*) 1969
Thesis: Arteriosclerosis Obliterans: A Case-Control Study
Special Field: Epidemiology and Biostatistics

DOCTOR OF SCIENCE IN BIOSTATISTICS

Phyllis B. Michelsen, A.B. (*Barnard Coll.*) 1949, S.M. (*Columbia Univ.*) 1952
Thesis: Characteristics of an Actuarial Estimator of a T-Year Survival Risk

Ronald Wyzga, A.B. (*Harvard Univ.*) 1964, S.M. (*Florida State Univ.*) 1966
Thesis: A Statistical Analysis of the Relationship Between Daily Mortality and Air Pollution Levels

DOCTOR OF SCIENCE IN HEALTH SERVICES ADMINISTRATION AND POPULATION SCIENCES

Jean Eileen Morehead, A.B. (*Grinnell Coll.*) 1955, M.P.H. (*Univ. of Minnesota*) 1967
Thesis: Intra-Uterine Device Retention: A Study of Selected Social-Psychological Aspects

DOCTOR OF SCIENCE IN NUTRITION

Ezzat Khamis Amine, B.Sc. (*Univ. of Alexandria, Egypt*) 1964, S.M. IN HYG. (*Harvard Univ.*) 1969
Thesis: Iron Deficiency and the Utilization of Dietary Iron

Joseph Bandele Fashakin, B.Sc. (*McGill Univ., Canada*) 1964, S.M. (*Michigan State Univ.*) 1966, S.M. (*Massachusetts Institute of Technology*) 1968
Thesis: Protein Degradation and Synthesis in Amino Acid Deficiencies

Robert Denis Lynch, A.B. (*Northeastern Univ.*) 1964, S.M. IN HYG. (*Harvard Univ.*) 1966
Thesis: Exogenous Fatty Acids, Monoglycerides and Esteraces in L-Fibroblast Lipogenesis

Pamela Ann Trueheart, A.B. (*Radcliffe Coll.*) 1967, S.M. IN HYG. (*Harvard Univ.*) 1969
Thesis: Some Effects of Growth Hormone, Insulin, Theophylline and Dibutryl Cyclic AMP on Glucose Metabolism of Adipose Tissues From Fed and Fasted Rats

SCHOOL OF PUBLIC HEALTH

DOCTOR OF SCIENCE IN PHYSIOLOGY

Eileen Walkavich Prince, A.B. (*Anna Maria Coll.*) 1966, S.M. IN HYG. (*Harvard Univ.*) 1968
Thesis: Effects of Fatty Acids and Tocopherol on the Radiosensitivity of Mammalian Erythrocytes
Special Field: Radiobiology

DOCTOR OF SCIENCE IN POPULATION SCIENCES

Elizabeth Murphy Whelan, A.B. (*Connecticut Coll.*) 1965, M.P.H. (*Yale Univ.*) 1967, S.M. IN HYG. (*Harvard Univ.*) 1968
Thesis: Marriage, Conception and Birth in Massachusetts

MASTER OF PUBLIC HEALTH

Mirna Iwonne Aeschlimann-Herrera, M.D. (*Univ. of Chile*) 1962
Dileep Gopal Bal, M.B.,B.S. (*All India Instit. of Medical Sciences*) 1968, S.M. (*Columbia Univ.*) 1970
Jonathan Berall, A.B. (*Univ. of Chicago*) 1962, M.D. (*Tufts Univ.*) 1966
Jay Crispin Bisgard, A.B. (*Northwestern Univ.*) 1964, M.D. (*ibid.*) 1967
Caroline Vogel Blonde, A.B. (*Wheaton Coll.*) 1964, M.D. (*Union Univ.*) 1968
Mark Edmund Bradley, S.B. (*Univ. of Notre Dame*) 1958, M.D. (*Univ. of Maryland*) 1962, S.M. (*Univ. of Pennsylvania*) 1969
Kenneth Bridbord, B.CH.E. (*Cooper Union*) 1964, M.D. (*Univ. of Chicago*) 1969
Barbara Hertz Burr, A.B. (*Swarthmore Coll.*) 1965, M.D. (*Harvard Univ.*) 1969
Valentin Pierre Cassan, M.D.V. (*Lyon Faculty of Medicine, France*) 1968
William Robert Craig, A.B. (*Univ. of Oregon*) 1964, A.M. (*Harvard Univ.*) 1967
Jeffrey Alan Cutler, A.B. (*Wesleyan Univ.*) 1963, M.D. (*Univ. of Kentucky*) 1968
Mark Degnan, S.B. (*Manhattan Coll.*) 1963, M.D. (*McGill Univ., Canada*) 1967
Jonathan Fielding, A.B. (*Williams Coll.*) 1964, A.M. (*Harvard Univ.*) 1969, M.D. (*ibid.*) 1969
Katherine Alden Finseth, A.B. (*Radcliffe Coll.*) 1963, M.D. (*Harvard Univ.*) 1967
Jerold Martin Frankel, A.B. (*Amherst Coll.*) 1966, D.M.D. (*Harvard Univ.*) 1970
Frank Anthony Franklin, Jr., A.B. (*Yale Univ.*) 1964, M.D. (*Univ. of Maryland*) 1968
Kathleen Agnes Gaffney, A.B. (*Cornell Univ.*) 1965, M.D. (*ibid.*) 1969
William Edward Halperin, A.B. (*Univ. of Pennsylvania*) 1968
William Henry Hollinshead, III, A.B. (*Princeton Univ.*) 1964, M.D. (*Univ. of Minnesota*) 1968
Aaron Ezebuilo Ifekwunigwe, M.B.,B.S. (*Univ. of London, England*) 1957, M.D. (*ibid.*) 1964, D.T.M. & H. (*Univ. of Liverpool*) 1961
Frank Joseph Jehle, Jr., A.B. (*Wayne State Univ.*) 1962, M.D. (*ibid.*) 1965
John Cannon Kepper, S.B. (*State Univ. of Iowa*) 1942, D.D.S. (*ibid.*) 1943
Cornelis A. Kolff, S.B. (*Allegheny Coll.*) 1967

John Cecil Leadbeater, A.B. (*Univ. of Colorado*) 1957, M.D. (*ibid.*) 1961
Theo Clyde Manschreck, A.B. (*Carleton Coll.*) 1967
Gladys E. Martin, M.B.,B.S. (*Univ. of London, England*) 1962
Arnold F. Mazur, A.B. (*City Univ. of New York*) 1965, M.D. (*Yale Univ.*) 1969
Lucien Alanzo Moolenaar, II, D.D.S. (*Marquette Univ.*) 1968
German Enrique Mora, M.D. (*National Univ., Colombia*) 1957, M.P.H. (*ibid.*) 1961
Edilberto Morales, M.D. (*Univ. of Panama*) 1959
Gail I. Moreschi, A.B. (*Trinity Coll.*) 1963, M.D. (*Woman's Medical Coll. of Pennsylvania*) 1967
Michael Desmond Murphy, M.B.,B.CH. (*University Coll., Ireland*) 1966
Anthony Charles Mustalish, A.B. (*New York Univ.*) 1962, M.D. (*ibid.*) 1966
Kenneth Kenji Nakano, A.B. (*Pomona Coll.*) 1963, M.D. (*Columbia Univ.*) 1967
Chong Dal Park, M.D. (*Chon-nam Univ., Korea*) 1958
Rudolph Walter Pierce, S.B. (*U.S. Naval Acad.*) 1951, M.D. (*Harvard Univ.*) 1958
Habib Redjeb, B.S. (*Univ. of Paris, France*) 1959, M.S. (*ibid.*) 1964, M.D. (*Faculty of Medicine, Belgium*) 1969
Keith Stewart Reisinger, A.B. (*Washington & Jefferson Coll.*) 1965, M.D. (*Univ. of Pittsburgh*) 1969
Roger Alan Rosenblatt, A.B. (*Harvard Univ.*) 1967
Eleanor M. Santiago, M.D. (*Univ. of St. Tomas, Philippines*) 1961
William Bart Saxbe, Jr., A.B. (*Amherst Coll.*) 1963, M.D. (*Harvard Univ.*) 1967
Norman Barnett Schell, A.B. (*New York Univ.*) 1946, M.D. (*ibid.*) 1950
Philip G. Sullivan, A.B. (*Providence Coll.*) 1954, M.D. (*Tufts Univ.*) 1958
James Michael Taylor, A.B. (*Amherst Coll.*) 1960, M.D. (*State Univ. of New York at Buffalo*) 1964
Christopher C. Tennant, M.B.,B.S. (*Sydney Univ., Australia*) 1968
Philip Mitchell Torrance, II, A.B. (*Princeton Univ.*) 1958, M.D. (*Johns Hopkins Univ.*) 1962
Jose F. Trabal-Santos, S.B. (*Univ. of Puerto Rico*) 1962, M.D. (*ibid.*) 1966
Fernand W. Turcotte, B.A. (*Univ. of Montreal, Canada*) 1962, M.D. (*ibid.*) 1966
Anthony Francis Vuturo, Jr., A.B. (*Bellarmine Coll.*) 1962, M.D. (*Univ. of Kentucky*) 1966
Roland Louis Weinsier, S.B. (*Univ. of Florida*) 1964, M.D. (*ibid.*) 1968
Lawrence West, A.B. (*Manchester Coll.*) 1960, M.D. (*Temple Univ.*) 1968
William Hastings Wiese, A.B. (*Yale Univ.*) 1960, M.D. (*Harvard Univ.*) 1964

MASTER OF INDUSTRIAL HEALTH

Robert Mervin Clapperton, M.D. (*Univ. of Zulia, Venezuela*) 1962
William Michael Johnson, A.B. (*Stanford Univ.*) 1963, M.D. (*ibid.*) 1968, M.P.H. (*Harvard Univ.*) 1970
Gilles Prosper Theriault, B.A. (*St. Joseph Coll., Canada*) 1961, M.D. (*Laval Univ., Canada*) 1966

SCHOOL OF PUBLIC HEALTH

MASTER OF SCIENCE IN BEHAVIORAL SCIENCES

Alexander E. MacLeod, B.D.S. (*Univ. of Glasgow, Scotland*) 1959, D.D.S. (*Dalhousie Univ., Canada*) 1962, M.A. (*ibid.*) 1970

Michael Hugh Nelson, L.R.C.P. (*Royal Coll. of Physicians, Scotland*) 1959

MASTER OF SCIENCE IN BEHAVIORAL SCIENCES AND EPIDEMIOLOGY

Carlos E. Climent, M.D. (*Universidad del Valle, Colombia*) 1966

MASTER OF SCIENCE IN BIOSTATISTICS

Carol Ann Cohen, S.B. (*Brooklyn Coll.*) 1969

MASTER OF SCIENCE IN ENVIRONMENTAL HEALTH

(Air Pollution Control)

Ronald John Hurley, S.B. (*Tufts Univ.*) 1969

(Industrial Hygiene)

Ray C. Woodcock, A.B. (*Taylor Univ.*) 1967

(Medical Physics)

James Martin Galvin, S.B. (*Univ. of Cincinnati*) 1963, S.M. (*ibid.*) 1965, S.M. (*ibid.*) 1968

Lisa Marie Hartnagel, A.B. (*State Univ. Coll., New York*) 1969

(Radiological Health)

William V. Lipton, A.B. (*Tufts Univ.*) 1967, S.M. (*Brown Univ.*) 1969

MASTER OF SCIENCE IN EPIDEMIOLOGY

Alan Leviton, A.B. (*New York Univ.*) 1959, M.D. (*State Univ. of New York*) 1963

Rolf Willi Schmauz, M.D. (*Univ. of Tubingen, Germany*) 1966

MASTER OF SCIENCE IN HEALTH SERVICES ADMINISTRATION

Connie Joann Evashwick, A.B. (*Stanford Univ.*) 1969, A.M. (*ibid.*) 1970

Anne Brown Keith, A.B. (*Radcliffe Coll.*) 1964

John Rodak, A.B. (*Case Western Reserve Univ.*) 1963, S.M. IN HYG. (*Univ. of Pittsburgh*) 1966

Francisco Jose Yepes, B.SC. (*San Jose Coll., Colombia*) 1957, M.D. (*Univ. of Antioquia, Colombia*) 1964, M.P.H. (*ibid.*) 1967

MASTER OF SCIENCE IN MATERNAL AND CHILD HEALTH

JoAnn Isberg Eckels, S.B. (*Univ. of Wisconsin*) 1961, S.M. (*Boston Univ.*) 1964

MASTER OF SCIENCE IN MICROBIOLOGY

Joan Barenfanger, S.B. (*Univ. of Illinois*) 1968

MASTER OF SCIENCE IN NUTRITION

Hayleon Dias Weerasinghe, M.B.,B.S. (*Univ. of Ceylon*) 1951, D.P.H. (*Univ. of Edinburgh, Scotland*) 1961, PH.D. (*ibid.*) 1962

MASTER OF SCIENCE IN NUTRITION AND EPIDEMIOLOGY

Jose Obdulio Mora, M.D. (*National Univ., Colombia*) 1959, M.P.H. (*ibid.*) 1962

MASTER OF SCIENCE IN PHYSIOLOGY

(Radiobiology)

Ann Sharyn Randtke, A.B. (*Vassar Coll.*) 1969

Larry Haynes Westerfield, S.B. (*Univ. of Kentucky*) 1963, M.D. (*ibid.*) 1967

(Toxicology)

Lawrence Jacob Jenkins, Jr., A.B. (*Central Methodist Coll.*) 1958

MASTER OF SCIENCE IN POPULATION SCIENCES

Esther Hoyt Ewing, A.B. (*Radcliffe Coll.*) 1968

Nirmala Murthy, B.A. (*Elphinstone Coll., India*) 1965, A.M. (*Bombay Univ., India*) 1967

On March 6, 1972, the following degrees were conferred:

DOCTOR OF PUBLIC HEALTH

Hugh Hanna Tilson, A.B. (*Reed Coll.*) 1963, M.D. (*Washington Univ.*) 1964, M.P.H. (*Harvard Univ.*) 1969

Thesis: Stability of Employment of the Physician in Neighborhood Health Services

Special Field: Health Services Administration

DOCTOR OF SCIENCE IN BIOSTATISTICS

Judith Doris Goldberg, A.B. (*Barnard Coll.*) 1965, S.M. IN HYG. (*Harvard Univ.*) 1967

Thesis: The Effects of Misclassification on the Analysis of Data in 2 x 2 Tables

DOCTOR OF SCIENCE IN ENVIRONMENTAL HEALTH

Bruce Anthony Egan, A.B. (Harvard Univ.) 1961, S.M. (*ibid.*) 1962, S.M. IN HYG. (*ibid.*) 1969

Thesis: Numerical Modeling of Urban Air Pollution Transport Phenomena

Special Field: Air Pollution Control

SCHOOL OF PUBLIC HEALTH

DOCTOR OF SCIENCE IN EPIDEMIOLOGY AND BIOSTATISTICS

Alexander John McLean, B.E. (*Univ. of Adelaide, Australia*) 1961, M.E. (*ibid.*) 1968, S.M. IN HYG. (*Harvard Univ.*) 1968
Thesis: The Epidemiology of Pedestrian Highway Injury

DOCTOR OF SCIENCE IN PHYSIOLOGY

Jerry Randall Williams, A.B. (*Texas Christian Univ.*) 1957, B.SC. (*National Univ. of Ireland*) 1960, M.SC. (*ibid.*) 1960
Thesis: The Survival of Cultured Human Cells Irradiated with Ultraviolet Light
Special Field: Radiobiology

MASTER OF SCIENCE IN ENVIRONMENTAL HEALTH

(Medical Physics)

Martin James Kandes, S.B. (*California State Coll.*) 1968, M.P.H. (*Yale Univ.*) 1970

MASTER OF SCIENCE IN EPIDEMIOLOGY

Kahl-Martin Colimon, M.D. (*Universidad Nacional de Colombia*) 1966, M.P.H. (*Universidad de Antioquia, Colombia*) 1969

MASTER OF SCIENCE IN HEALTH SERVICES ADMINISTRATION

Peter Theodore Choras, S.B. (*McGill Univ., Canada*) 1957, M.D. (*ibid.*) 1959
Therese Marie Malcolm, A.B. (*Boston Univ.*) 1954, A.M. (*ibid.*) 1955
Wendy Kathleen Marson, B.SC.N. (*Univ. of British Columbia, Canada*) 1963, M.P.A. (*Harvard Univ.*) 1971

Index

Officers of Administration, Instruction and Research

KEY TO MAP

HARVARD SCHOOL OF PUBLIC HEALTH

1. Rotch Building
   55 Shattuck Street
   - Administration
   - Behavioral Sciences
   - Health Services Administration
   - Maternal and Child Health

2. Health Sciences Laboratories
   665 Huntington Avenue
   - Biostatistics
   - Epidemiology
   - Kresge Center for Environmental Health (Environmental Health Sciences and Physiology)
   - Microbiology
   - Nutrition
   - Population Sciences
   - Tropical Public Health

3. EDUCATIONAL FACILITIES BUILDING (677 Huntington Avenue)

4. Henry Lee Shattuck International House
   199–203–207 Park Drive

HARVARD MEDICAL SCHOOL

5. Medical School Quadrangle
   25 Shattuck Street

5A. Building A — Administration

6. Vanderbilt Hall
   (Medical Area Health Services)
   109 Avenue Louis Pasteur

7. HARVARD SCHOOL OF DENTAL MEDICINE
   188 Longwood Avenue

8. FRANCIS A. COUNTWAY LIBRARY OF MEDICINE
   10 Shattuck Street

9. PETER BENT BRIGHAM HOSPITAL

10. MASSACHUSETTS MENTAL HEALTH CENTER

11. CHILDREN'S CANCER RESEARCH CENTER

12. CHILDREN'S HOSPITAL MEDICAL CENTER

13. SHIELDS WARREN RADIATION LABORATORY

14. NEW ENGLAND DEACONESS HOSPITAL

15. BETH ISRAEL HOSPITAL

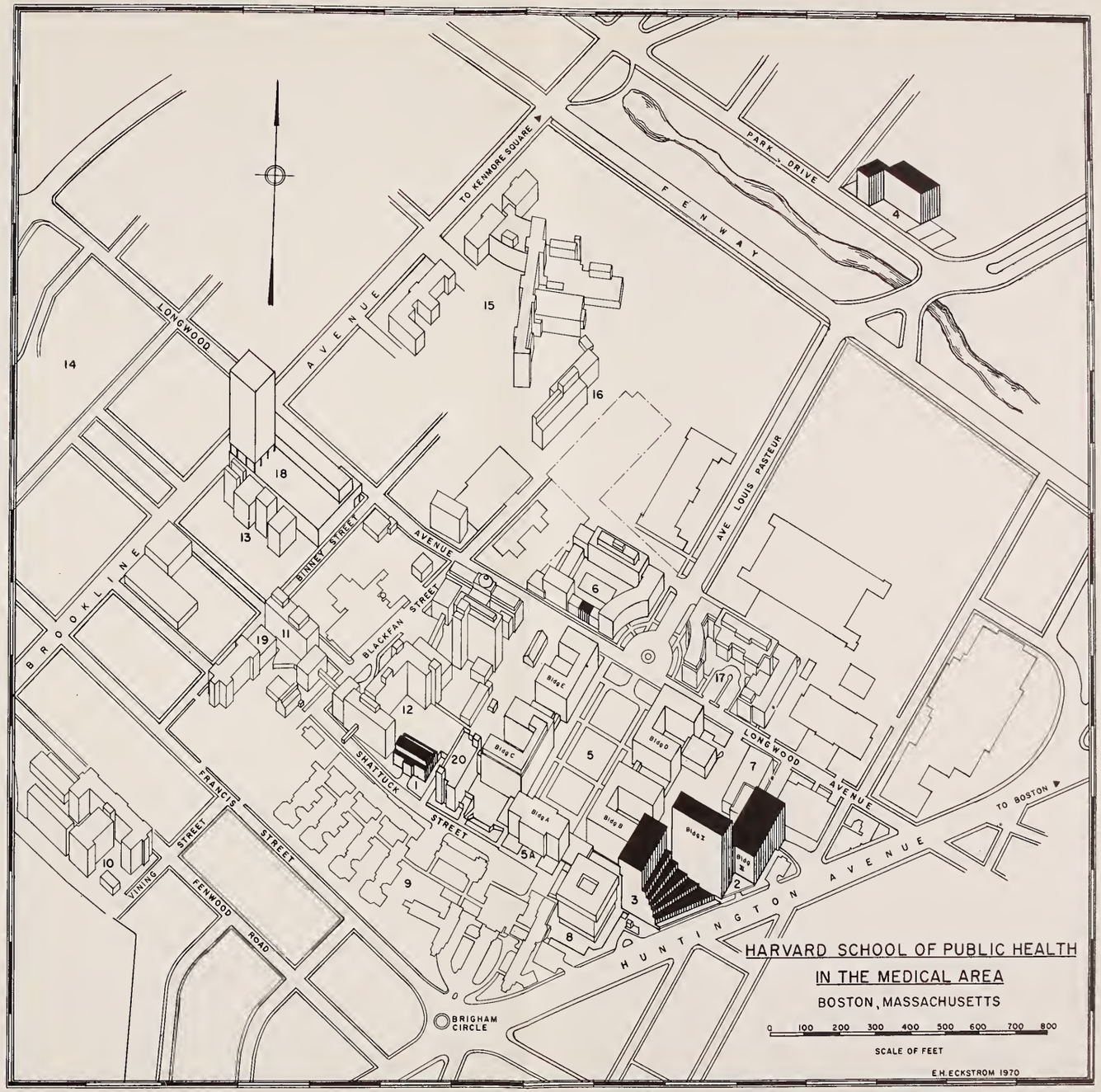
16. JUDGE BAKER GUIDANCE CENTER

17. BOSTON HOSPITAL FOR WOMEN (LYING-IN DIVISION)

18. MEDICAL AREA COOP

19. JIMMY FUND AUDITORIUM

20. LABORATORY FOR HUMAN REPRODUCTION AND REPRODUCTIVE BIOLOGY



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